SCIENCE

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THE RELATIONS OF COLLEGES TO SECONDARY SCHOOLS IN RESPECT TO PHYSICS

THE interesting meeting of physicists which was held at Worcester from the seventh to the tenth of September, as a part of the twentieth-year celebration of Clark University, was almost unique in the amount of attention secured, from a body consisting mainly of university or college teachers, for questions relating to the best methods of teaching physics and the proper relations of school physics to college physics. The credit for this, as for the many other successful features of the meeting, was largely due to Professor Webster, who arranged for a number of conferences to consider such questions as the following, proposed by himself, and took a leading part in the resulting discussions:

1. What can be done to give the public a greater knowledge of physics?

2. What is the object of teaching physics in school and college?

3. How shall we increase the popularity of physics in the schools?

4. Shall physics be taught as if all students were to be potential physicists?

5. Shall physics be taught with more mathematics or less?

6. Is it desirable that physics and mathematics be taught by the same teachers in the schools?

7. What proportion of time must be devoted to dynamics?

8. Is a course of descriptive physics alone without mathematics or laboratory work desirable?

9. Is it desirable that the college prescribe a course in physics?

10. Can the colleges be got to prescribe a course in physics for all students?

11. What is the proper function of general physics in the curriculum of the college of liberal arts?

12. How shall physics be taught to engineering students?

13. How can the student be induced to get a more catholic view of general physics?

14. Has the introduction of courses in pedagogy been justified by the results?

15. Is there any reason that theoretical physics should languish in America?

16. Is the importation of professors of physics from Europe necessary and desirable?

No formal action was taken at any of these conferences; but at the second the nine propositions given below[1] were presented, and at the last conference a majority of those present signed the statement which follows the propositions.

1. That, while the amount of academic attainment in physics which the prospective school teacher of this subject should have can not be definitely fixed, it may be usefully, if somewhat vaguely, indicated as the state of advancement at which, if the man were to be a candidate for the doctorate, he would naturally begin the special research intended for his thesis.

2. That this preparation should include an elementary knowledge of the calculus and some acquaintance with the general facts, principles and laboratory methods of chemistry.

3. That school authorities should not be content with the appointment of a well-trained and competent teacher. They should see to it that the good teacher has good tools and good conditions for his work, a well-appointed laboratory, an equally well-appointed lecture room and relief from unnecessary manual labor.

4. That this relief of the teacher from unnecessary manual labor will require, as a rule, the services of a man of all work, sufficiently skilled to use well the elementary tools of the mechanic, sufficiently permanent in his place to know thoroughly the building in which he works and its equipment, sufficiently teachable and willing to make him a cheerful helper to the teachers of physics and chemistry in whatever assistance they may with reason ask of him.

5. That the school teacher, so trained and so equipped, should have all the liberty in the method and scope of his teaching which is consistent with the general consensus as to good practise, this consensus to be reached, in the case of schools which have close relations with the colleges, by painstaking, sympathetic and persistent efforts on the part of all concerned to come to an understanding with each other for the purpose of promoting their common interest, the best attainable instruction in science for the youth of our country.

6. That the examination by means of which the attainments of school pupils are estimated in their candidacy for admission to college should include a laboratory test.

7. That colleges which accept but do not require physics as a part of the preparation for admission should so arrange their elementary teaching of physics as to make an important distinction between those who have and those who have not passed in physics at admission.

8. That, accordingly, such colleges should maintain a physics course substantially equivalent to the physics courses of good secondary schools.

9. That colleges should require of the schools no quantitative treatment of kinetics, or the behavior of matter undergoing acceleration.

The undersigned, without committing themselves to approval of all the propositions given above, commend them to the serious consideration of college and school teachers of physics and express the hope that they may be made the subject of discussion at the coming meeting of the American Association for the Advancement of Science.

A. G. Webster (Clark University), C. L. Speyers, Norman E. Gilbert (Dartmouth College), W. E. McElfresh (Williams College), A. P. Wills (Columbia University), C. Barus (Brown University), J. C. Hubbard (Clark University), F. A. Waterman (Smith College), E. A. Harrington, Ernest C. Bryant, A. de F. Palmer, Jr. (Brown University), Norton Adams Kent (Boston University), Guy G. Becknell, Robert H. Goddard, Louis P. More (University of Cincinnati), James E. Ives (University of Cincinnati), R. W. Wood (Johns Hopkins University), E. F. Nichols (Dartmouth College), A. Wilmer Duff (Worcester Polytechnic School), C. H. Andrews (Worcester High School), C. A. Butman.

In explanation and support of these propositions[2] I gave an informal talk, the

[1] The ninth was at first in a somewhat different form from that here printed.

[2] I make these propositions entirely on my own responsibility and must not be understood to represent in this action any other member of the Harvard Department of Physics.

substance of which, with some added documentary matter, is here set down. My excuse for narrating at such length the history of college entrance requirements in physics is my belief that college men, as a rule, know very little of this history and are therefore not in position to understand fully the present condition of physics in the schools or the possibilities of improving and utilizing the work there done.

In 1886 the Harvard University catalogue contained for the first time, in its statement of the alternative requirements in physical science for admission to the freshman class, the following:

A course of experiments in the subjects of mechanics, sound, light, heat and electricity, not less than forty in number, actually performed at school by the pupil.

In 1887 a pamphlet with the title "Descriptive List of Experiments in Physics," giving detailed descriptions of apparatus and detailed directions for forty exercises to meet this requirement, was issued by Harvard.

In 1889, in response to complaints from the schools that the pamphlet just described was too restrictive, a new edition was published giving forty-six exercises, of which the candidate might omit any six.

In the year 1897–98 the Harvard catalogue contained for the first time an amended statement of the requirement in elementary physics, much longer than the original statement and with less exclusive emphasis on the laboratory work of the pupil. As this statement is still in force at Harvard, and as the influence of Harvard on the teaching of physics in schools is frequently spoken of as deplorable, it may well be given here, lengthy though it is. It reads thus:

A course of study dealing with the leading elementary facts and principles of physics, with quantitative laboratory work by the pupil.

The instruction given in this course should include qualitative lecture-room experiments, and should direct especial attention to the illustrations and applications of physical laws to be found in every-day life. The candidate will be required to pass a written examination, the main object of which will be to determine how much he has profited by such instruction. This examination may include numerical problems. It will contain more questions than any one candidate is expected to answer, in order to make allowance for a considerable diversity of instruction in different schools.

The pupil's laboratory work should give practise in the observation and explanation of physical phenomena, some familiarity with methods of measurement, and some training of the hand and the eye in the direction of precision and skill. It should also be regarded as a means of fixing in the mind of the pupil a considerable variety of facts and principles. The candidate will be required to pass a laboratory examination, the main object of which will be to determine how much he has profited by such a laboratory course.

The candidate must name as the basis for his laboratory examination at least thirty-five exercises selected from a list of about sixty described in a publication issued by the university under the title "Descriptive List of Elementary Exercises in Physics." In this list the divisions are mechanics (including hydrostatics), light, heat, sound and electricity (with magnetism). At least ten of the exercises selected must be in mechanics. Any one of the four other divisions may be omitted altogether, but each of the three remaining divisions must be represented by at least three exercises.

The candidate will be required to present a note-book in which he has recorded the steps and the results of his laboratory exercises, and this note-book must bear the endorsement of his teacher, certifying that the notes are a true record of the pupil's work. It should contain an index of the exercises which it describes. These exercises need not be the same as those upon which the candidate presents himself for the laboratory examination, but should be equivalent to the latter in amount and grade of quantitative work.

The note-book is required as proof that the candidate has formed the habit of keeping a full and intelligible record of laboratory work through an extended course of experiments, and that his work has been of such a character as to raise a presumption in favor of his preparation for the examination. But much greater weight will be

given to the laboratory examination than to the note-book in determining the candidate's attainments in physics. Experience has shown that pupils can make the original record of their observations entirely presentable, so that copying will be unnecessary, and they should in general be required to do so.

This course, if taken in the last year of the candidate's preparation, is expected to occupy in laboratory work, recitations and lectures, five of the ordinary school periods, about fifty minutes in length, per week for the whole year. With few exceptions exercises like those in the descriptive list already mentioned can be performed in a single school period, but for satisfactory results it will often be necessary to repeat an exercise. Two periods per week for the year should be sufficient for the laboratory work proper. If the course is begun much earlier than the last year of the candidate's preparation, as it well may be, it will require more time.

A new edition of the Harvard "Descriptive List" was issued in 1897. It contained sixty-one exercises, though the laboratory requirement was now reduced to thirty-five exercises.

The arrangement of exercises in the new list was peculiar, optics being interpolated between two divisions of mechanics. This was part of an attempt to encourage the performance of elementary laboratory experiments by pupils in the early years of the secondary school course or even in the grammar school.

A third edition of the list, with many changes in details but no fundamental alterations, appeared in 1903, and this, with possibly slight typographical corrections, is the current form of this familiar document.

In 1897 a committee on physics of the science department of the National Educational Association was appointed to assist in the work of the association's general committee on college entrance requirements. The make-up of the physics committee was as follows:

E. H. Hall (chairman), Harvard University.
H. S. Carhart, University of Michigan.
R. B. Fulton, University of Mississippi.
C. L. Harrington, Sachs' Collegiate Institute, New York.
Julius Hortvet, East Side High School, Minneapolis.
C. J. Ling, Manual Training School, Denver.
E. L. Nichols, Cornell University.
E. D. Peirce, Hotchkiss School, Lakeville, Conn.
Fernando Sanford, Stanford University.
B. F. Thomas, Ohio State University.
Edward R. Robbins, Lawrenceville School, Lawrenceville, N. J.

This committee evolved five general propositions which, without substantial change, were in 1890 commended by the departments of secondary and higher education of the National Educational Association and recommended to the colleges of the country "as offering a basis for the practical solution of the problems of college admission" in physics. These propositions were:

1. That in public high schools and schools preparatory for college physics be taught in a course occupying not less than one year of daily exercises, more than this amount of time to be taken for the work if it is begun earlier than the next to the last year of the school course.

2. That this course of physics include a large amount of laboratory work, mainly quantitative, done by the pupils under the careful direction of a competent instructor and recorded by the pupil in a note-book.

3. That such laboratory work, including the keeping of a note-book and the working out of results from laboratory observations, occupy approximately one half of the whole time given to physics by the pupil.

4. That the course also include instruction by text-book and lecture, with qualitative experiments by the instructor, elucidating and enforcing the laboratory work, or dealing with matters not touched upon in that work, to the end that the pupil may gain not merely empirical knowledge, but, so far as this may be practicable, a comprehensive and connected view of the most important facts and laws in elementary physics.

5. That college admission requirements be so framed that a pupil who has successfully followed out such a course of physics as that here described may offer it toward satisfying such requirements.

But the general committee on college entrance requirements insisted on having more detailed recommendations from the physics committee. Accordingly I, knowing that various members of this latter body, if body it could properly be called with its parts separated by hundreds or even thousands of miles, held strongly to various opinions concerning details, at last sent to the general committee as my personal suggestion the titles of the Harvard "Descriptive List," at the same time notifying every other member of the physics committee of my action and asking each to make any suggestion of his own in the same way. To my surprise only one other member of the committee sent any recommendations of his own. Professor Carhart sent a number, which, however, were probably not intended as a complete alternative for the Harvard list. The general committee printed both sets of suggestions, with some introductory paragraphs of which one only need be given here:

OUTLINE OF LABORATORY WORK IN PHYSICS FOR SECONDARY SCHOOLS

At least thirty-five exercises, selected from a list of sixty or more, not very different from the list given below. In this list the divisions are mechanics (including hydrostatics), light, heat, sound, and electricity (with magnetism). At least ten of the exercises selected should be in mechanics. The exercises in sound may be omitted altogether; but each of the three remaining divisions should be represented by at least three exercises.

This paragraph, too, with the list which followed, became a part of the matter recommended to the colleges of the country in 1900 by the departments of secondary and higher education of the National Educational Association.

In 1901 the "Definition of Requirements," issued by the recently established College Entrance Examination Board of the Middle States and Maryland, contained the following statement:

The requirement in physics is based on the report of the committee on physics of the science department of the National Educational Association.

It is recommended that the candidate's preparation in physics should include:

(*a*) Individual laboratory work, comprising at least thirty-five exercises selected from a list of sixty or more, not very different from the list given below.

(*b*) Instruction by lecture-table demonstrations, to be used mainly as a basis for questioning upon the general principles involved in the pupil's laboratory investigations.

(*c*) The study of at least one standard textbook, supplemented by the use of many and varied numerical problems, "to the end that the pupil may gain a comprehensive and connected view of the most important facts and laws in elementary physics."

The list of titles of experiments which follows this passage in the original context is precisely the same as that numbered from 1 to 61 in the report of the National Educational Association and in the Harvard "Descriptive List."

All this may seem to be a record of easy and triumphant progress, during the years 1897–1901, for the physics course under discussion. Perhaps the ease was too great for the triumph, if such there was, to last. Criticisms and complaints soon began to be heard. At a meeting of the New England Association of Colleges and Preparatory Schools in October, 1901, President Hall, of Clark University, pronounced a sweeping condemnation of the kind of physics teaching which had come into the schools through the influence especially of Harvard College. This was the more significant, rather than less, by reason of the fact that President Hall had during the early years of the Harvard "Descriptive List" expressed approval of its character. In spite of an early prepossession in its favor, he had become entirely dissatisfied by its working in the schools, as he understood the results of that working. Nor did he long remain alone as a pronounced critic

and opponent of the system of physics teaching under discussion. Professor Woodhull, of Teachers College, Columbia University, as the spokesman, no doubt, of a considerable proportion of the physics teachers in middle state schools, took a similar position. More conspicuously still, Professor Mann, of the University of Chicago, proclaiming in no uncertain tones the need of a "new movement among physics teachers," undertook to organize against the prevalent system the discontent of physics teachers throughout the country and to formulate proposals for a change. Many committees were accordingly appointed, many *questionnaire* circulars were issued, much cogitation of replies was gone through—with what result may appear later in this history.

Indeed, so active has been the fire of criticism and of condemnation directed during the last six or eight years against the influence of colleges on the school teaching of physics that, in representing the large share held by Harvard in this influence, I am making something in the nature of a confession. Nevertheless, there are several reasons for believing that the influence in question has not been altogether bad and that the present condition of physics in the schools does not need to be reformed altogether. Some of these reasons I will give.

1. The college requirement of laboratory work by school pupils has done much to make the school teaching of physics in this country a respected profession instead of a mere incidental occupation, as it used to be, for some teacher whose main work lay in another field. There are now in this country several large and vigorous associations of physics teachers. To one of the largest and best of these, the Eastern Association of Physics Teachers, I have the honor of belonging, as an associate member. I attend its meetings regularly and believe I am right in saying that, on the whole, it is fairly well satisfied with the college requirement in physics as maintained and administered by Harvard. That is, where the Harvard plan has been longest on trial and has had the most direct and powerful influence, it is better liked than in other parts of the country.

2. European countries are gradually establishing in their secondary schools courses of laboratory work closely resembling those given in the schools of this country, and complimentary references to American practise in this respect are frequent in the writings of European teachers, some of whom freely declare their indebtedness to American precedents.

3. The "new movement among physics teachers," mentioned above, has had remarkably little revolutionary effect, less, indeed, than I think it should have. To justify this statement I will give a brief account of the recent movement for the revision of the physics requirement of the College Entrance Examination Board.

Early in 1908 a committee was appointed to make this revision. Its membership was: Henry S. Carhart, University of Michigan; A. D. Cole, Vassar College; A. W. Goodspeed, University of Pennsylvania; John W. Hutchins, High School, Walden, Mass.; Flavel S. Luther, Trinity College, Hartford; C. R. Mann, University of Chicago; C. A. Perkins, University of Tennessee; Frank Rollins, Stuyvesant High School, New York City; Wallace C. Sabine, Harvard University (chairman); H. L. Terry, inspector of schools, Madison, Wis.

Late in the year this committee made a majority report to the general board of revision of the College Entrance Board, and two members, Professor Mann and Mr. Terry, made a minority report. The following quotations from the minority re-

port will show what impression the majority report made on those who had been active in the "new movement" and will be a fitting introduction to the next stage in this history:

We dissent from the report of the majority for the following reasons:

The underlying principle of the report of the majority is that physics is essentially a science of accurate measurements—the only such subject in the high school course—and hence it is the duty of physics to lay great stress on accurate quantitative work in order that the high school pupils may get somewhere in this course an insight into such work.

. . . . . .

Your minority is convinced that physics as a science of exact measurements belongs wholly in the college, and that physics in the high school should not give such prominence to the science of accurate measurements nor make use of the abstract and unusual system of absolute units. We respectfully urge that high school physics should teach the student how to organize his experience with physical phenomena in such a way as to get clear conceptions of some of the larger laws of physical nature. In this process experiments and to some extent quantitative work are necessary; but such highly refined quantitative work as is now generally demanded should not be insisted on, and all such work should be done in terms of the familiar engineers' units like the pound-weight and the foot-pound instead of the dyne and the erg.

Your minority wishes also to point out that your committee on this physics requirement is not a representative committee.

. . . . . .

We therefore are convinced that the report of the majority does not represent the consensus of opinion of the ablest secondary school teachers as to the present needs of physics in the high school; but that it is simply a statement of the current habits of teaching physics—habits that have been developed under the influence of ideals of college physicists rather than because of an appreciation of the ideals of the high school pupils.

. . . . . .

In view of this, your minority wishes to make the following recommendations to your board:

1. That the board of review increase the size of its physics committee by appointing or getting appointed in such a way as it may elect six or more physics teachers from various sections of the country who are recognized as successful and experienced teachers of physics and who are at present actively engaged in teaching physics in secondary schools. This would insure a representative committee.

2. That the report of the majority and the minority, together with similar reports of the North Central Association of Colleges and Secondary Schools and of the Physics Club of New York, be referred back to this more representative committee for full and complete discussion.

The board of revision, instead of following strictly the first recommendation made by the minority of the original committee, appointed a new committee consisting solely of six physics teachers in secondary schools, and to this committee it turned over the whole, I believe, of the matter mentioned in the second recommendation, as given above. The membership of the new committee was: N. Henry Black, Roxbury Latin School, Boston (chairman); W. M. Butler, Yeatman High School, St. Louis; Winthrop E. Fiske, Phillips Academy, Exeter, N. H.; Daniel E. Owen, Penn Charter School, Philadelphia; Frank B. Spaulding, Boys' High School, Brooklyn; Willis E. Tower, Englewood High School, Chicago.

In April, 1909, this committee made its report to the College Entrance Board. This report was in part as follows:

In submitting this report, we desire to call attention to the following points:

1. The report has received the unanimous approval of the committee.

2. We recommend that the College Entrance Board no longer undertake the marking or examination of the laboratory note-book[3] (see form of certificate recommended in lieu thereof).

3. We urge upon those who prepare the examination questions that these be so planned that students who have received fair preparation on

[3] I am informed by the chairman of the committee that this recommendation was due to the difficulties experienced by the College Board in receiving and transmitting the great number of note-books it has hitherto undertaken to deal with.

this work as here outlined may reasonably be expected to pass.

GENERAL STATEMENT

1. The unit in physics consists of at least 120 hours of 60 minutes each. Time spent in the laboratory shall be counted at one half its face value.

2. The course of instruction in physics should include:

(*a*) The study of one standard text-book, for the purpose of obtaining a connected and comprehensive view of the subject. The student should be given opportunity and encouragement to consult other scientific literature.

(*b*) Instruction by lecture-table demonstration to be used mainly for illustration of the facts and phenomena of physics in their qualitative aspects and in their practical applications.

(*c*) Individual laboratory work consisting of experiments requiring at least the time of thirty double periods. The experiments performed by each student should number at least thirty. Those named in the appended list are suggested as suitable. The work should be so distributed as to give a wide range of observation and practise.

The aim of the laboratory work should be to supplement the pupil's fund of concrete knowledge and to cultivate his power of accurate observation and clearness of thought and expression. The exercises should be chosen with a view to furnishing forceful illustrations of fundamental principles and their practical applications. They should be such as to yield results capable of ready interpretation, obviously in conformity with theory, and free from the disguise of unintelligible units.

Slovenly work should not be tolerated, but the effort for precision should not lead to the use of apparatus or processes so complicated as to obscure the principle involved.

3. Throughout the whole course special attention should be paid to the common illustrations of physical laws and to their industrial applications.

4. In the solution of numerical problems, the student should be encouraged to make use of the simple principles of algebra and geometry, to reduce the difficulties of solution. Unnecessary mathematical difficulties should be avoided and care should be exercised to prevent the student's losing sight of the concrete facts, in the manipulation of symbols.

The "appended list" of laboratory exercises which "are suggested as suitable" contains fifty-one titles, mostly one-line titles, without any details of method. The great majority of these are practically equivalent to titles found in the list, with sixty-one titles, originally adopted by the College Entrance Board or to combinations[4] of such titles. The new titles to which, apparently, nothing in the original list explicitly corresponds are the following:

15. Efficiency test of some elementary machine, either pulley, inclined plane or wheel and axle.

16. Laws of the pendulum.

17. Laws of accelerated motion (if by this is meant a laboratory study by the pupils of falling bodies and not the comparison of masses by acceleration-test and the action and reaction, of the old list).

23. Cooling curve through change of state (during solidification).

38. Magnifying power of a lens (if this means more than is implied in the shape and size of a real image formed by a lens, of the old list).

39. Construction of model of telescope or compound microscope.

41. Magnetic induction (unless this is covered by the telegraph sounder and key, the electric motor and the dynamo, of the old list).

45. Electrolysis (which apparently means something additional to the study of a single fluid voltaic cell and study of a two fluid voltaic cell, titles taken from the old list to the new).

47. Resistance measured by volt-ammeter method.

50. Study of induced currents (if this means more than the dynamo, of the old list).

51. Power or efficiency of a small electric motor (if this means more than the electric motor of the old list).

The report in question gave also a syllabus of "topics which are deemed fundamental and which should therefore be included in every well-planned course of elementary physics." As this syllabus covers nearly four type-written pages and seems to include nearly everything that one would expect to find in the table of contents of a

[4] For example, where the original list had *elasticity: stretching; elasticity: bending; elasticity: twisting*, this new list has *Hook's law.*

general school text-book of physics, I shall not reproduce it here.

This report, made unanimously by a committee of six school teachers of physics, was accepted *in toto* by the College Entrance Board and now stands as the extended definition of the physics requirement of that board. I here repeat the opinion which I have expressed earlier in this paper, that the revision, left at last entirely to experienced school teachers of physics, has made no revolutionary change in the requirement, and that we are therefore justified in concluding that such teachers do not condemn as bad, on the whole, the influence of college requirements on the school teaching of physics.

It would be quite a different thing, however, to express for myself or for school teachers the opinion that the present state of physics in the schools is satisfactory, except as a temporary stage of development under difficult conditions. Many teachers, especially those new to the kind of work required, have too little knowledge of their subject, many school boards are unwilling or unable to give the teacher proper facilities and needed assistance, many college men are out of sympathy with school men and take too little account of what they accomplish. Finally, we have thus far attempted, in my opinion, to cover too wide a field in school courses, or, at least, we have attempted one part of this field which is impracticable with an ordinary class in a school course, the region of dynamics, or kinetics. Seven or eight years ago I raised the question, "Should we, therefore, give up the attempt to teach this part of physics in school courses, or the early courses in college and content ourselves with giving, in mechanics, the statical aspect only?" and said, "I fear that many teachers will answer this question in the affirmative, but I am not yet ready to do so." Now, after years of further experience and observation, I have come to the point of making proposition 9 in the early part of this paper. I have been brought to this point partly by what I have heard in the debates of the Eastern Association of Physics Teachers, partly by the opinions expressed by other associations of teachers with the encouragement of Professor Mann and Professor Woodhull, but largely by my own experience and observation of pupils. Here, it seems to me, rather than in its assault on the general character of college requirements in physics, the "new movement" has found a vulnerable place and has indicated a way of improvement.

When the physicist looks at the familiar formula,

$$\text{force} = \text{mass} \times \text{acceleration},$$

notes its simplicity and lets his mind enter for a moment the vast regions of illumination and power which it opens up, he is only too apt to overlook the aspect which this law takes for the beginner in physics in this country. Let me, therefore, write down several of the forms in which the youngster is asked to recognize and use it:

$$\text{force (dynes)} = \text{mass (grams)} \times \text{accel. (cm. per sec. per sec.)},$$

$$\text{force (poundals)} = \text{mass (pounds)} \times \text{accel. (ft. per sec. per sec.)},$$

$$\text{force (gms.-wt.)} = \text{mass (grams)} \times \text{accel. (cm. per sec. per sec.)} \div g\,(=981),$$

$$\text{force (lbs.-wt.)} = \text{mass (pounds)} \times \text{accel. (ft. per sec. per sec.)} \div g\,(=32+).$$

Even without adding to these the form which many engineers would insist on, *force (lbs.-wt.) = mass × acceleration,* in which the mass of a one-pound weight is called $(1 \div g)$, we see that the difficulty is a serious one. Are we justified in putting it in the way of school pupils who, in the great majority of cases, will never have occasion, after their academic days, to use the acceleration formula in any shape, and who will find in the other regions of physics

plenty of interesting and useful matter to occupy their attention during that small part of their school course which can be devoted to this subject? And would not college teachers of physics prefer to have boys come to them from the schools well grounded in the elements of static mechanics, without kinetics, than to have them come with a very uncertain knowledge of both?

EDWIN H. HALL

CAMBRIDGE, MASS.,
September 23, 1909

THE INTERNATIONAL CONGRESS OF RADIOLOGY AND ELECTRICITY

AN international Congress of Radiology and Electricity is to be held in Brussels from September 13 to 15, 1910, under the patronage of the Belgian government and the French Physical Society. This is the second conference on the subject, the first having been held in Liège, in the autumn of 1905. The second conference, like the first, has on the honorary committee some of the leading scientists in Europe and America who are working along the lines included in the subjects of the conference. The list includes among others Madame Curie, Lord Rayleigh, Sir W. Ramsay, Sir J. J. Thomson, Sir O. Lodge, Sir Wm. Crookes, Professors Lorentz, Rutherford Langevin, Arrhenius, Lenard, Goldstein, H. Poincaré, Planck, Righi, Schuster, Zeeman and certain eminent physicians.

The congress has for its chief purpose the bringing together of a number of scientists capable of discussing the fundamental problems arising out of the phenomena of radioactivity and ionization; of agreeing upon a standard terminology; of presenting reports embodying a summary of our knowledge on the various divisions of the subject; and of showing the medical and therapeutic applications of the phenomena. The conference is therefore of concern to physicists, chemists, biologists and medical practitioners.

The officers of the American committee are at present Professor Carl Barus, Brown University, Providence, R. I., chairman, and Professor G. F. Hull, Dartmouth College, Hanover, N. H., secretary, to whom inquiries may be addressed.

The provisional program of the conference is as follows:

FIRST SECTION—TERMINOLOGY AND RADIOMETRY

Terminology.—Fundamental notions; ions, electrons, corpuscles, etc. Unification of notations.

Radiometry.—General methods of measurement; apparatus, units.

Measurement of radioactivity; supports of the radioactive body; its influences, standardization. The establishment of a unit of radiation. Applied radiometry.

SECOND SECTION—PHYSICAL SCIENCES

A. *Theories and Fundamental Hypotheses.*—The ether, its manifestations, its properties, its relations to matter. The electric and magnetic field, electrons and ions; formation and properties. Magnetic and electric properties of bodies; metallic conductivity, electrolysis; dielectric phenomena; magnetism. Contact electricity. Thermo-electricity. Electro-capillary phenomena.

B. *Radiation.*—Generation. Emission, absorption; phenomena of radiation. Observation and analysis of radiation. Spectroscopy. Physical and chemical effects of radiation, phosphorescence. Electro-optics and magneto-optics, the Zeeman effect. Applied radiology, apparatus.

C. *Radioactivity.*—Radioactive bodies; enumeration and distinctive characters of the methods of separation. Radioactivity of matter in general. Properties of radioactive substances. Radioactive transformation; emanation, induced activity, etc. Atomic disaggregation. Radioactive constants.

D. *Atomistics.*—Number, charge, mass and velocity of particles. Molecular and atomic structure; valency. Colloids; Brownian movements.

E. *Cosmical Phenomena.*—The atmospheric electric field; its origin, variations of electrical potential of the atmosphere; ionization of the atmosphere. Observatories for atmospheric electricity; organization. Systematic registry of atmospheric electricity. Atmospheric radioactivity; atmospheric precipitation. Distribution of radioactive substances on the surface and in the interior of the earth. Terrestrial magnetism. The aurora borealis and magnetic storms. Solar radiation; variability of the field of this radiation, its heterogeneity and influence on terrestrial phenomena. Solar magnetic fields.

THIRD SECTION—BIOLOGICAL SCIENCES

A. *Biology Proper.*—Under this schedule are to be included all communications relative to the

action of different radiations on organisms. The following topics have thus far been proposed as being suitable for special reports: (1) Action of the X-rays and of radioactivity on cellular structure; (2) action of radiations in general on the development of plants.

B. *Medical Radiology.*—Radio-diagnosis. This schedule is to include all the medical applications of radioscopy and radiography. Three topics have been admitted up to the present time as probably suitable for reports: (1) Rapid radiography; instantaneous radiography; (2) study of the stomach and of the intestines, from the physiologic and the pathologic points of view; (3) endodiascopy.

C. *Radio-therapeutics.*—Under this schedule will be included all reports appertaining to the treatment of diseases by radiation. (*a*) X-rays; (*b*) radioactivity; (*c*) other radiations. The following topics have also been provisionally considered: (1) The filtration of rays (X-rays and radioactivity); (2) radioactive medicines; (3) treatment of tumors by radium; (4) present state of photo-therapeutics and its different methods.

The specifications of the present program are merely provisional; they are to be considerably altered in the final revision. A special exposition of all apparatus and appliances comprehended under the present subject will be annexed to the congress.

Attention may finally be directed to certain rules of the congress.

Art. 2.—The following persons will be members of the congress and they alone will receive the publications: (1) the delegates of the Belgian public administration and the delegates of foreign governments; (2) donors, including those persons who have given a sum of 100 francs or more; (3) all persons who have contributed the sum of 20 francs. The wives of members as well as their unmarried children may be registered as associates at a fee of 10 francs. The same charge will be made to students.

Art. 3.—The members of the congress and their associates will alone have the right to participate in its scientific transactions, to take part in its excursions, etc.

All members will receive the publications in full, both before and after the session of the congress. They will be entitled to enter the exposition at Brussels gratuitously on presenting their cards.

It is particularly requested that all communications of a financial nature (membership fees, etc.) be addressed directly to the general secretary of the committee on organization, M. Daniel, No. 1 Rue de la Prévôté, Brussels, Belgium.

By order of the American Committee.

HANOVER, N. H. G. F. HULL,
Secretary

WINTER MEETING OF THE AMERICAN CHEMICAL SOCIETY

THE winter meeting of the society will be held in Boston, Mass., December 28 to 31 inclusive, in affiliation with the American Association for the Advancement of Science, whose associated societies meet throughout the week.

Railroad rates will probably be secured as usual and as there is to be a large gathering of scientists in Boston this winter, there will undoubtedly be a sufficient number of persons present to make these reduced rates available.

The society will meet in six divisions and two sections under the guidance of the officers enumerated below.

DIVISIONS

Agricultural and Food Chemistry.—Chairman W. D. Bigelow, Bureau of Chemistry, Washington, D. C.; secretary, W. B. D. Penniman, 213 Courtland St., Baltimore, Md.

Fertilizer Chemistry.—Chairman, F. B. Carpenter, Richmond, Va.; secretary, J. E. Breckenridge, Carteret, N. J.

Industrial Chemists and Chemical Engineers.—Chairman, A. D. Little, 93 Broad St., Boston, Mass.; secretary, B. T. Babbitt Hyde, 82 Washington St., New York City.

Organic Chemistry.—Chairman, R. S. Curtiss, University of Illinois, Urbana, Ill.; secretary, Ralph H. McKee, Orono, Maine.

Pharmaceutical Chemistry.—Chairman, A. B. Stevens, University of Michigan, Ann Arbor, Mich.; secretary, B. L. Murray, Merck & Co., New York City.

Physical and Inorganic Chemistry.—Chairman, C. H. Herty, Chapel Hill, N. C.; secretary, W. D. Bancroft, 7 East Ave., Ithaca, N. Y.

SECTIONS

Biological Chemistry.—Chairman, S. C. Pres-

cott, Massachusetts Institute of Technology, Boston, Mass.

Chemical Education.—Chairman, H. P. Talbot, Massachusetts Institute of Technology, Boston, Mass.

A sectional meeting for the special consideration of rubber chemistry is also proposed and any one interested is requested to write the secretary at once.

Members desiring to present papers are requested to send title and brief abstract to one of the above named persons, except for the Section of Chemical Education, where a special program is being arranged, on or before November 15 or to the secretary of the society on or before November 19. Titles of all papers *received* before November 20 will appear on the preliminary program, which will be sent to all members. The final program will be sent only to those members signifying their intention of being present at the meeting or who make special request for same. No title can be placed on the final program that reaches me later than December 10. In the preparation of papers for presentation a clear and concise statement of results obtained and conclusions reached should alone be given. All unessential and technical details should be reserved for the published paper, as the time that can be allotted is limited and papers given in this manner are always much better received. Any person requiring more than fifteen minutes for the delivery of his paper should either abstract it sufficiently to come within this time or obtain a special extension by writing to the chairman of the division previous to the meeting.

Summer Meeting, 1910

The summer meeting of 1910 will be held in San Francisco at a date not yet decided upon. Special notice of this meeting is inserted here in order that members may be planning some time ahead for this trip to California. The California Section is making special arrangements for our entertainment and attempts will be made to have a special train or at least special cars leaving from some central point for eastern members so that they may go together and obtain additional enjoyment from the journey. It is possible that side trips may be arranged and it is expected that the date will precede the date of the meeting of the American Association for the Advancement of Science in Honolulu so that members who desire may go to this meeting after the meeting of the American Chemical Society. The secretary hopes that all members who intend to attend this meeting will write him so that a general idea may be obtained as to the possibility of special arrangements.

American Chemical Society, 1909

The current year has been one of continued growth and success for our society as shown by an unusual enthusiasm among its members and by the large increase in membership. The society is now the largest chemical society in the world and approximates 4,500 members.

The publications of the society have for two years been issued on time and they have acquired a standing which should be a source of pride to every member. *Chemical Abstracts* continues to be received with acclaim the world over and its influence for the good of the society is continually growing. The new *Journal of Industrial and Engineering Chemistry,* with its board of thirty-five editors, all of whom are specialists in the lines they represent, has now nearly completed its first year with results that speak for themselves. It is also worthy of note that the new paper used in the *Journal of the American Chemical Society* and in *Chemical Abstracts,* which was adopted on the recommendation of the highest expert advice in America, is adding greatly to the usefulness of these two publications. On account of its lightness, strength and durability, *Chemical Abstracts* can this year be bound in two volumes instead of in three as heretofore, and the *Journal of the American Chemical Society,* which had already reached such a size that further binding in a single volume was out of the question, can now be bound as heretofore, making it much more attractive for our library shelves. The resultant saving in binding cost of two large volumes will be appreciated by the membership.

During the year President Whitney has visited a large number of the local sections of the society and increased their enthusiasm by the spirit he has shown.

The Baltimore meeting was the largest ever held in the history of the society and the Detroit summer meeting, while smaller in numbers than the winter meeting, which is always the case, had the largest attendance of any meeting ever held by the society in the summer. Both meetings were thoroughly enjoyed by the members present.

The policy of organizing the society in divisions, begun in 1908, has been continued during the present year and the Divisions of Physical and Inorganic Chemistry, Fertilizer Chemistry, Agricultural and Food Chemistry, Organic Chemistry and Pharmaceutical Chemistry have been established and their work is daily growing in importance. Members who have not identified themselves with those divisions in which they are especially interested should do so at once by dropping a postal card to the secretary of the division.

It is hoped that all members will make a special effort to be present at the Boston meeting. Too few of our members realize the inestimable benefit to the individual and the profession which may be gained by regular attendance at the general meetings of the society. A member who is not thoroughly acquainted may feel a little strange at the first meeting which he attends, but he is sure to make many friends and get much information, and if he attends two meetings in succession begins to feel so thoroughly at home that he is almost always seen thereafter. Those who have once realized the great advantage of being present seldom fail to attend if possible.

Local sections have been established during the year at Milwaukee, Wis.; Cleveland, Ohio; Seattle, Wash., and Columbia, Mo. The local sections have, with one or two possible exceptions, fully met the spirit which pervades the whole society of due economy in their local expenses in order that the funds of the society may be utilized to meet the great cost of our publications, for most of the members realize fully that the society is expending a much larger proportion of its income upon its publications than any other unendowed society in the world. Every member secures the benefit of any sacrifice he may make in his local section by the increased good which results to the whole society therefrom. Some of the sections have again this year entirely met their own expenses while others have been run at a minimum cost.

Members will be interested to know that our official delegate to the World's Congress of Chemists in London, Dr. W. H. Nichols, was elected acting president of the World's Congress of Chemists to be held in the United States in 1912 and that our honorary member, Dr. E. W. Morley, was elected honorary president.

Official Insignia or Pin

Members will be interested to note that an official insignia or pin for the society was adopted at the Detroit meeting. This badge may be obtained from Tiffany & Company, of New York, in the form of a pin, button or scarf pin, on order obtained by addressing the secretary of the society. The pin is of fourteen-carat gold and is one of the most attractive emblems possessed by any of the scientific societies of the country. It consists of a square with one of the points forming the top of the pin. The upper triangular half of the square contains the figure of a phœnix rising from the flames, typical of chemical activity and of the new birth of substance through the energy of chemical change. The lower part of the square contains in gold the letters *A. C. S.* and a small, unobtrusive Liebig bulb on a background of enamel.

Future of the American Chemical Society

The future success of the society and the returns it can make to its members will, as heretofore, depend largely upon the size of that membership, as additional funds are required to continue and enlarge the work we have undertaken. It may seem to some that now we are the largest chemical society in the world the effort for a continued increase in membership is not warranted as it has been, but there are still some three thousand chemists and possibly more in the country who have

not joined in the work we are undertaking who ought to be with us, for our efforts are for the benefit of every chemist in America and every chemist should do his part. The only way to reach these is through the energetic, individual help of the members, who can aid the society in this way.

Some of these non-members probably never can be made to understand that they have any part to perform in elevating the standard of the profession in the country nor see any personal responsibility therein so long as they are able to read journals provided for them by others. Possibly a few have no ambition for personal advancement and care little about the advancement of American chemistry as such, but this is not true of many. Some have not been invited, but with most the reason that they are not with us is simply due to the fact that the matter has not been presented to them individually in the correct light. The argument of the journals we are publishing, of the fact that more and more corporations are urging their chemists to identify themselves with us, that many employers are asking whether or not young men belong to our society as a guarantee of the fact that they are alive and interested in the development of the profession, has been placed before them, but the fact that they are not personally assisting in the movement and that it is their duty as well as privilege to do so may not have been shown. These non-members do not realize that if we had no more than one thousand members our present publications would cost those members at least thirty dollars per year each; that by the union of 4,500 chemists we have been able to return to the individual material which could not have been furnished in any other way and that two thousand more members will enable us almost to double the work that we are now doing. Will you not help present to them the fact that it is this *union* of American chemists that is so rapidly advancing American chemistry, that is giving it prominence approaching nearer and nearer to that of Germany and that they should, if worthy members of that profession, do their annual part towards its development.

Census of American Chemists

The secretary is attempting to secure a list of all American chemists with their addresses, whether they are members of the American Chemical Society or not. He would be greatly obliged to any member who will send him names and addresses of non-members of the society in order that they may be added to this list if not already thereon. It would be a special favor if chief chemists of large industrial firms would send him a list of all chemists in their employ to be checked off for this purpose.

Charles L. Parsons,
Secretary of the American Chemical Society

THE NATIONAL CONFERENCE COMMITTEE ON STANDARDS OF COLLEGES AND SECONDARY SCHOOLS

The fourth annual meeting of the National Conference Committee on Standards of Colleges and Secondary Schools was held in the rooms of the dean of the Graduate School of Arts and Sciences of Harvard University, University Hall, Cambridge, Mass., on Saturday, October 9, 1909. All the organizations which send delegates to the conferences of this committee were represented, the delegates being as follows: President George E. MacLean, the State University of Iowa, from the National Association of State Universities; Headmaster Wilson Farrand, Newark Academy, from the College Entrance Examination Board; Professor Nathaniel F. Davis, Brown University, from the New England College Entrance Certificate Board; Dean Herman V. Ames, the University of Pennsylvania, from the Association of Colleges and Preparatory Schools of the Middle States and Maryland; Principal Frederick L. Bliss, the University School of Detroit, from the North Central Association of Colleges and Secondary Schools; Chancellor James H. Kirkland, Vanderbilt University, from the Association of Colleges and Preparatory Schools of the Southern States; Secretary James G. Bowman (in place of President Henry S. Pritchett), from the Carnegie Foundation for the Advancement of Teaching; Dr. Elmer E.

Brown, the United States Commissioner of Education, and Dean Frederick C. Ferry, Williams College, from the New England Association of Colleges and Preparatory Schools.

The officers of the past year were reelected as follows:

President—President George E. MacLean.
Vice-President—Headmaster Wilson Farrand.
Secretary-Treasurer—Dean Frederick C. Ferry.

The sub-committee of four, consisting of Headmaster Farrand, President Pritchett, Principal Bliss and Dean Ferry, appointed at the 1908 meeting to formulate the definition of the minute for the measurement of admission requirements, submitted a final report on this question, which was adopted after slight modification in the following form:

(DEFINITION)

A unit represents a year's study in any subject in a secondary school, constituting approximately a quarter of a full year's work.

(EXPLANATION)

This statement is designed to afford a standard of measurement for the work done in secondary schools. It takes the four-year high-school course as a basis, and assumes that the length of the school year is from thirty-six to forty weeks, that a period is from forty to sixty minutes in length, and that the study is pursued for four or five periods a week; but, under ordinary circumstances, a satisfactory year's work in any subject can not be accomplished in less than one hundred and twenty sixty-minute hours or equivalent. Schools organized on any other than a four-year basis can, nevertheless, estimate their work in terms of this unit.

The sub-committee was requested to continue its consideration of various subjects already before it and to report again at the next meeting. It is hoped in particular that it will present at that time recommendations as to some accurate use of the terms "progress of study," "curriculum," "course of study," "hour," "count," "point," "exercise," etc.

The committee passed a resolution expressing its approval of the tendency shown by many colleges to make their definitions of admission requirements conform to those of the College Entrance Examination Board, and its hope that the definitions of admission requirements published by that board come into universal use.

It was voted to invite the Association of American Universities to accept membership in the committee and to send a delegate to its meetings.

The full minutes of the proceedings of the conference will be printed and distributed to the members of the associations which are represented in the committee.

FREDERICK C. FERRY,
Secretary-Treasurer

THE NEW ENGLAND GEOLOGICAL EXCURSION

THE ninth annual intercollegiate geological excursion of New England was held in the northern Berkshires, Massachusetts, on Saturday, October 9, 1909, under the leadership of Professor H. F. Cleland, of Williams College. Representatives from Bates, Brown, Dartmouth, Harvard, Mt. Holyoke, Smith, Tufts, Wellesley, Wesleyan, Williams and Yale Colleges, the normal schools at Boston, North Adams, Salem and Worcester and other institutions, a total of 44, gathered for a preliminary discussion in Hotel Wendell, Pittsfield, on Friday evening. At this meeting papers were read on the glacial geology of the region to be traversed by Professor Cleland, on the areal geology by Professors Barrell and T. Nelson Dale, and on the anthropogeography by Professor Davis.

The party left Pittsfield at eight o'clock, Saturday morning, on a special electric car and made its first stop at the outlet of Glacial Lake Bascom. Here Professor Cleland explained the conditions attending the formation and the various halts of this former lake, and Professor Davis discussed the esker which traversed the valley. A second stop was made at the glass sand quarries and mill at Cheshire where Professor Emerson spoke of the origin of the sand and furnished the party with an explanation of its physical characters. Mr. C. Q. Richmond, superintendent of the Berkshire Street Railway, gave an interesting description of the industries of the Hoosic valley.

Following this, a fine series of glacial forms were seen; a kame terrace, which was the subject of a talk by Professor Goldthwait; the Great Esker; a well-marked and interesting moraine; and a great variety of kames. In addition, a delta terrace which was formed by a tributary of Lake Bascom and a broad high terrace on the old shore line of this same lake were observed. The scars of the Greylock landslides of August, 1901, were seen from the car. Nooning was taken at Williamstown where the members of the party enjoyed the hospitality of Williams College and were the guests of the officers of the college at a dinner served in the new College Commons.

In the afternoon, the party visited the natural bridge of the Hoosac mountains and studied the transition between the marble of the Natural Bridge quarry and the calcareous mica schists at the foot of the mountain.

It is just to add that the pleasures of the trip were enhanced by delightful weather and by the gorgeous spectacle of the mountains arrayed in autumnal colors.

Robert M. Brown

Worcester, Mass.

Wisconsin Geological and Natural History Survey

The legislature of 1909 appropriated $30,000 annually for the use of this survey. Of this sum $10,000 is a permanent appropriation, which the survey has received for several years. An appropriation of $10,000 for two years, chiefly for the use of the highway division, was repeated and a new appropriation of $10,000 annually for two years was granted for the establishment of a soil survey. The commissioners of the survey have appointed William O. Hotchkiss, formerly economic geologist of the survey, to the position of state geologist, and have placed the geological work of the survey under his immediate charge. For the present a considerable part of Mr. Hotchkiss's time is being given to the highway department, which has been under his direction.

The last legislature appointed a special committee to make suitable investigations and draw a bill providing for state aid for roads. This committee is studying the question of state aid along lines suggested by Mr. Hotchkiss and is requiring much service from him. The regular road and bridge work of the highway division of the survey has consisted in aiding towns and counties to spend more efficiently the taxes they raise for highway purposes. This has been done by bringing more business-like methods into use, and by making careful surveys, designs and estimates. The assistance thus given to local officers has been greatly appreciated by them, as it has given them technical advice and trained supervision. This work is carried on by A. R. Hirst, M. W. Torkelson and H. J. Kuelling.

A report on the peat resources of the state is in preparation by F. W. Huels, who has been working under Mr. Hotchkiss's direction.

Mr. Hotchkiss and Mr. F. T. Thwaites have been compiling a new geological map of the state, which will be issued in connection with a bulletin on the general geology of the state.

E. H. J. Lorenz has been employed to make a physiographic model of the state, under the direction of Mr. Hotchkiss and Mr. Thwaites. This model is on a scale of seven miles to the inch and will show in a graphic manner the various topographic forms. It is planned to distribute copies of this model to the various educational institutions of the state.

The natural history division of the survey has continued its work under the immediate charge of the director, E. A. Birge and the biologist, Chancey Juday. During the summer the field work for a forthcoming report on the dissolved gases and plankton of the Wisconsin lakes has been completed and the report will very shortly be ready for the press. This work has been carried on in cooperation with the U. S. Bureau of Fisheries and with financial assistance from it.

The work on the fishes of the state has been prosecuted under the general charge of George Wagner. A careful study is being made of the distribution, habits and food of the cisco of Lake Geneva. H. H. T. Jackson has spent a large part of the summer in collecting the

various species of whitefish from lakes in the northern part of the state. This collection was made in order to study the local distribution of the local species and varieties of this group of fish.

The most important new work of the survey, namely, the investigation of the soils of the state, is carried on by the Geological and Natural History Survey, cooperating with the college of agriculture and the bureau of soils of the federal government. This survey is under the general direction of Professor A. R. Whitson, of the college of agriculture. In the developed portions of the state a detailed survey is being made, the counties selected this year being Iowa, Waukesha, Waushara and a portion of Bayfield. Engaged in the field work in these areas are G. B. Jones, P. O. Wood, G. B. Maynadier, J. W. Nelson and Clarence Lounsbury from the bureau of soils, and LeRoy Schoenmann, A. H. Meyer, A. H. Kuhlman and T. J. Dunnewald from the survey and the college of agriculture.

In the undeveloped portions of the state a reconnaissance survey is being made. This is in immediate charge of Samuel Weidman, geologist on the survey, assisted by W. S. Smith, of the bureau of soils, E. B. Spraker and E. B. Hall, of the survey, and F. L. Musback, of the college of agriculture. Dr. Weidman is completing the work carried on for some years in several counties of the northwestern portion of the state, and also mapping Marinette County, in the northeastern part of the state. It is expected that the field work in all these areas will be completed during the present season.

SCIENTIFIC NOTES AND NEWS

AT the recent inauguration of Dr. E. F. Nichols as president of Dartmouth College, honorary degrees were conferred on a number of college presidents, including a doctorate of laws on Dr. C. R. Van Hise, president of the University of Wisconsin, and a doctorate of science on Dr. Richard C. Maclaurin, of the Massachusetts Institute of Technology.

ON the occasion of the inauguration of Dr. E. B. Bryan as president of Colgate University, the honorary degree of doctor of science was conferred on Dr. John M. Clarke, state geologist of New York, and on Dr. F. C. Perry, professor of mathematics at Williams College.

DR. M. TREUB, has retired from the directorship of the Botanical Garden at Buitenzorg.

DR. EMIL ROSENBERG has retired from the active duties of the chair of anatomy at Utrecht.

DR. THEODOR WEBER, emeritus professor of medicine at Halle, has celebrated his eightieth birthday.

MR. JAMES BRITTEN has retired from the botanical department of the British Museum after thirty-eight years of service.

THE Rumford committee of the American Academy of Arts and Sciences has made an additional grant of $300 to Professor L. R. Ingersoll, of the University of Wisconsin, for the continuation of his research on the optical constants of metals.

THE Paris Academy of Medicine has awarded a prize of £160 to M. W. Haffkine for his work on inoculation against cholera.

IN appreciation of his work in the Pennsylvania State Department of Health, Dr. Samuel G. Dixon, state health commissioner, was presented with a silver loving cup by the county medical inspectors of the state and chiefs of the state tuberculosis dispensaries, at a meeting held in Philadelphia on October 5.

SIR THOMAS ELLIOTT, secretary to the British Board of Agriculture and Fisheries, has been nominated by the French government to be a Companion of the Order "du Mérite Agricole."

A GOLD medal has been presented to Dr. Oswaldo Cruz in recognition of his services in extirpating yellow fever in Rio de Janeiro.

DR. L. KARPINSKI, of the University of Michigan, is spending the year at Columbia University, working on the history of mathematics.

THE magnetic survey yacht, *Carnegie,* arrived at St. John's, N. F., on September 26

and set sail on October 2, with Dr. Bauer aboard, for Falmouth, England. The vessel will then continue, under the command of Mr. Wm. J. Peters, to Madeira and return to New York, *via* Bermuda, some time next March. Dr. Bauer returns from Falmouth to Washington early in November. Every possible courtesy was extended the *Carnegie* at St. John's by the Newfoundland authorities, the governor, the premier and other prominent officials making special visits to the vessel. Mr. Carl Smith, expert on gas engines in the technologic branch of the U. S. Geological Survey, accompanied her as far as St. John's, as consulting expert.

Professor Arthur H. Blanchard, of the department of civil engineering of Brown University and deputy engineer under the State Board of Public Roads of Rhode Island, sailed on October 13 for a tour of eight months which will be devoted to an investigation of the construction and maintenance of bituminous macadam roads in France, England and Scotland.

Professor H. H. Stoek, in charge of mining engineering at the University of Illinois, has been appointed by Governor Deneen as a member of the State Mining Commission, which has been constituted to formulate desirable legislation with reference to the mining industry, and to recommend the same to the governor in anticipation of the next regular session of that body.

Mr. Charles T. Ripley, who graduated last June from the course in railway electrical engineering of the University of Illinois, has been awarded the first prize in the car design contest recently held under the direction of the John G. Brill Company, of Philadelphia. The prize consists of the John G. Brill Memorial Medal and $250. This contest was instituted by the John G. Brill Company and by them announced last fall to all schools giving instruction in electrical engineering or railway electrical engineering. The contest consisted in competitive designs for electric railway cars for city service and it was open to seniors in all schools of the country. Its purpose, as stated in the formal announcement, was to "awaken the intelligent interest of technical students in a field which offers great opportunities for personal endeavor, scientific research and a substantial reward."

Dr. Hugh Blackburn, emeritus professor of mathematics at Glasgow University, where he was appointed in 1849 the successor of Professor James Thomson, Lord Kelvin's father, and retired from active service in 1879, died on October 9, at the age of eighty-six years.

Mr. Richard Bannister, for many years chemist in the British government laboratory and known for his work on the chemistry of foods, died on September 7, at the age of seventy-four years.

Professor Cesare Lombroso, the eminent criminologist and author, died at Turin on October 18, of heart disease, at the age of seventy-three years.

The surgeon-general of the army announces that the war department has appointed permanent boards for the preliminary examination of applicants for appointment in the medical corps of the army to meet at Washington, D. C., Fort Sheridan (near Chicago), Illinois, and San Francisco, California, in addition to the usual preliminary examination boards that are assembled at various army posts throughout the United States from time to time. The permanent boards will hold sessions on the second Monday of each month. A limited number of successful candidates will be appointed first lieutenants in the medical reserve corps (salary $2,000 per annum) and assigned to army posts until the next session of the Army Medical School, when they will be ordered to attend the School as "student candidates." Applicants must be citizens of the United States, between twenty-two and thirty years of age, graduates of reputable medical schools, of good moral character and habits, and shall have had a year's hospital training after graduation, or its equivalent. Full information concerning the examination can be pro-

cured upon application to the "Surgeon General, U. S. Army, Washington, D. C."

A MALARIA conference attended by forty delegates from all parts of India met at Simla on October 12. Lord Minto, welcoming the members, stated that the deaths from fever in India during the last ten years averaged nearly four and a half millions. Last year the deaths were one million over the average, and the increase was believed to be due to malaria.

THE third session of the permanent commission of the International Seismological Association was held at Zermatt, Switzerland, from August 30 to September 3. It was very well attended. Of the 23 countries forming the association 20 were represented, as follows: Austria, Belgium, Bulgaria, Canada, Chile, Denmark, England, France, Germany, Greece, Hungary, Italy, Netherlands, Norway, Portugal, Roumania, Russia, Servia, Spain and Switzerland. Besides the delegates, other scientists were present making the total in attendance 42. Professor A. Schuster presided, and Dr. Hepites, of Bucharest, was elected vice-president. A goodly number of scientific papers was presented, besides the reports of committees on "Instruments," "Microseismic Movements," "Earthquake Catalogue," "Finance" and "Management of the Central Bureau." The next general meeting will be held at Manchester, England, in July, 1911.

THE Appalachian Engineering Association will convene in Washington, D. C., at the New Willard Hotel at 9:00 A.M., Friday, November 5. The program includes addresses by Major Wm. N. Page, of Washington, D. C., Richard H. Edmunds, editor of the *Manufacturers' Record,* Baltimore, Md., Dr. Thomas L. Watson, state geologist of Virginia, and papers by Professor R. L. Morris, of West Virginia University, Major W. J. Douglas, engineer of bridges for the District of Columbia, D. C. Weller, city engineer of Waynesboro, Pa., E. V. N. Heermance, president of the Virginia Concrete and Engineering Company, and H. Fernstrom, chief engineer of the Virginia Railway. On Saturday, November 6, by invitation of Superintendent Keppel, of the Union Terminal Company, the association will visit the mammoth interlocking plant at the new Union Station, after which Major Douglas, engineer of bridges for the district, will conduct the party to the gigantic reinforced concrete bridge on Connecticut Avenue. Headquarters will be at the New Willard Hotel and a very large attendance is promised. All engineers, geologists and persons interested in industrial development are cordially invited to attend these sessions.

IT is stated in *Nature* that the inaugural meeting of the China Philosophical Society was held at Tientsin on September 18, under the presidency of the president of the Pei Yang University, Mr. Wang Shoh Lian, who, in the course of his address, pointed out the importance of the existence of such a society in the present stage of China's development, when western learning is being spread over the Empire. After the delivery of the address papers were read by Dr. G. Purves Smith, on agricultural possibilities of North China, and by Dr. Wu Lien Teh, on an example of scientific farming in Chihli.

THE *Journal* of the American Medical Association states that the trachoma prize of the International Medical Congress was not awarded, but the $1,000 prize founded in 1897, by the City of Moscow, was given to Dr. O. Hertwig, professor of anatomy and comparative embryology at Berlin. The City of Paris prize of $600 was awarded to the serologist, M. J. Bordet, of Brussels. The Lenval prize of $80 was divided between Professor H. Neumann, of Vienna, and Dr. A. Grey, of Glasgow, at the international otology congress which also met at Budapest. It was decided that the international medical congresses should henceforth not be held oftener than once in four years, so that the next congress will not convene until 1913, when it will meet in London. The international committee appointed to prepare the preliminaries for the international medical congresses in future is to have its headquarters at the Hague, near which the secretary, Professor K. Wenckebach, resides. The members of the

committee are Professor Pavy, of London, M. Blondel, of Paris, as president and vice-president; the latter is also secretary of the International Medical Press Association, Dr. Maragliano, of Genoa, Dr. Müller, or Budapest, and Dr. Waldeyer, of Berlin.

UNIVERSITY AND EDUCATIONAL NEWS

The trustees of Princeton University have accepted the gift of $500,000 of Mr. W. C. Proctor, of Cincinnati, made on condition that an equal sum be obtained for the graduate school by May 1, 1910, and that the school be not situated where the house of the president now stands.

Haverford College has received $100,000 to establish a fund for pensioning its professors.

The General Education Board has made a conditional appropriation of $125,000 to Ohio Wesleyan University, at Delaware, O.

Mrs. Charles E. Perkins, of Burlington, Ia., has given $30,000 to Harvard University, to establish scholarships for students from Iowa.

Harvard University has received gifts amounting to $6,600, to be used for the immediate benefit of freshmen in Harvard College, under the direction of the assistant dean.

An additional sum of about $40,000 has been collected in the Canton district for the endowment of Hong Kong University.

The laboratories of The Rice Institute, at Houston, Texas, are being planned with the assistance of Professor J. S. Ames, of Baltimore; Professor E. G. Conklin, of Princeton; Professor T. W. Richards, of Cambridge, and Professor S. W. Stratton, of Washington.

When the former College of Medicine of the University of Southern California became the Los Angeles Medical Department of the University of California, the former university was left without a medical department. Recently, however, the College of Physicians and Surgeons of Los Angeles was taken over and made an integral part of the University of Southern California.

Dr. G. B. Longstaff, of New College, Oxford, has presented £2,400 as an additional endowment for the Hope department of zoology.

Mr. F. T. Havard has been appointed assistant professor of mining and metallurgy at the University of Wisconsin. Mr. Havard is a well known metallurgical engineer, and a frequent contributor to the technical press. He is a graduate of the Royal School of Mines, Freiberg, and has had his metallurgical experience in Germany, Chile, Montana and elsewhere.

The University of Pittsburgh has appointed Frederick L. Bishop, '98, formerly professor of physics at the Bradley Polytechnic Institute of Peoria, Ill., head of the department of physics.

Dr. G. A. Van Rynberk, associate professor of physiology at Rome, has been appointed professor of physiology at Amsterdam.

Mr. Walter Brudenell Gill, formerly scholar of Christ Church, Oxford, has been elected to a fellowship at Merton College to undertake research work in physics and to act as a demonstrator.

Dr. Karl Marbe, of Frankfort, has been appointed professor of philosophy at Würzburg.

Dr. K. Correns, of Leipzig, has been appointed professor of botany at Münster.

DISCUSSION AND CORRESPONDENCE

RECOMMENDATIONS REGARDING THE TREATMENT OF GENERA WITHOUT SPECIES, ETC.

As an outcome of the recent discussion in Science of the "Genera without Species" question, the following suggestions are offered for the consideration of zoologists and will be transmitted to the International Zoological Congress Committee on Nomenclature. They are the result of recent correspondence between Professor T. D. A. Cockerell and the writer, and have been formulated, and are here presented, by his suggestion and on lines proposed by him, with modifications that meet

his approval. They relate not only to speciesless genera, but to genera based on a species, or on a group of congeneric species, designated only by a vernacular name, unaccompanied by a diagnosis, or by an inadequate one.

1. A generic name proposed without mention of any described species is invalid unless it is accompanied by a diagnosis of such a character as to indicate that it is based on a previously known species, or group of species, that can be unequivocally identified as the basis of the diagnosis. Examples: *Gavia* J. R. Forster (1788), based exclusively on the loons, a small group of strictly congeneric species; *Fregata* and *Picoides* Lacépède (1799), based on single species obviously indicated by the diagnosis.

2. A generic name, proposed with or without a diagnosis, may be accepted if a genotype is designated merely by a vernacular name of unequivocal significance. Examples: *Plautus* Brünnich (1771), based on an unmistakable diagnosis of the great auk with the addition of the Danish vernacular name of the species; *Regulus* Cuvier (1800), proposed, without diagnosis, for the kinglets ("les roitelets" = *Motacilla regulus* Linn., as shown by Cuvier's previous (1798) use of these names).

In cases like the one last mentioned, a vernacular name is to be accepted as a genotype only when the author thus employing it has used the vernacular name accompanied by the equivalent systematic name in a previously published work, thus defining it beyond question. A vernacular name is also (and not otherwise) available as a genotype when accompanied by a reference to a work or author where it has been defined.

It is believed that these recommendations can be accepted without risk of serious complications. The first has long been a part of the A. O. U. Code; the second is not formally adopted as a rule, but is implied in the "remarks" under Canon XXXII. (p. lxi) of the Revised A. O. U. Code, which relates to *nomina nuda*. The following has a direct bearing upon this proposition:

The names of genera and subgenera given without diagnosis or any other indication of a type than a vernacular name without a citation of its previous use, as in Cuvier's "Tableau Général des Classes des Animaux," in the first volume of his "Leçons d'Anatomie Comparée" (and in other similar cases), are tenable if the vernacular name is one that has been used and defined by a then current systematic name by the same author in a previous work; the vernacular name in such cases defines the type.

J. A. ALLEN
AMERICAN MUSEUM OF NATURAL HISTORY

STABLE NOMENCLATURE PRACTICALLY UNATTAINABLE

TO THE EDITOR OF SCIENCE: I have read with much interest Mr. Jonathan Dwight's article in a recent number of SCIENCE on "The Burden of Nomenclature." While I am in sympathy with this article, and with the general tendency of modern systematic biologists to formulate rules and codes to govern the application of generic and specific names, I wish to emphasize the point that no matter how perfect such a code may be we can not hope that stability will be the immediate result. A very important factor in the application of names is the study of the organisms to which the names are applied. The perfect code would indicate the application of the names when the study of a group of organisms had been completed. When the study of all organisms has been completed we may hope for a more or less stable nomenclature. Until that time we must accept as inevitable a certain amount of change as groups are critically studied. It is true that much of the change during the present era is due to the use of different codes, to misinterpretation of rules and to what some are pleased to call the juggling of names, that is, an attempt to fix names without carefully studying the group concerned. But aside from this there is what we must accept as legitimate and inevitable change due to increased knowledge of the organisms and their nomenclatorial history. It is not necessarily an adverse criticism of a code that different editions of a list show changes in nomenclature. In my own work I have found that absolute stability of nomenclature is practically unattainable. Starting with the traditional application of names in a given group, investigation may show that many of these names have been misapplied. Two authors studying the same group at different times may apply the names in different

ways even when following the same code. This difference may be due to the fact that one author has more abundant material upon which to base his conclusion, or it may be due to a difference of opinion as to the relation of the organisms, or in the interpretation of the work of others. Differences in the application of names due to these causes are not the result of imperfections in the code followed, and no code can eliminate such changes. In fact it would be very unwise to attempt such elimination. Students must not be handicapped in serious study. On the other hand, it is well to discourage the study of nomenclature as apart from the study of organisms. I believe it is impossible for any person or any committee, to prepare a list of organisms which shall be permanent; partly because such person, or committee, may not be sufficiently familiar with the organisms, and partly because the knowledge concerning these organisms is ever increasing. The value of a code of nomenclature should be judged by its usefulness in determining the application of names, rather than by the changes that may result.

A. S. Hitchcock,
Systematic Agrostologist
Department of Agriculture,
Washington, D. C.

The Magnetic Storm of September 25, 1909

An exceedingly severe magnetic storm was recorded at the Cheltenham Magnetic Observatory on September 25, 1909, the first indications appearing as a slight disturbance of the magnets at 3:27 A.M., 75th meridian time.

The period of greatest disturbance began at 6:39 A.M. and lasted until about 4 P.M., and during most of this interval the movements of the recording magnets were so sudden and of so large amplitude that the spots of light failed to produce any impression on the photographic paper, except in the case of declination, where a partial record was secured.

From 6:39 to 8:17 A.M. the changes in the earth's magnetism were so great that the magnets were deflected far out of their normal positions and the spots of light passed beyond the limits of the photographic paper. During this interval the magnets which furnish a record of the changes in vertical intensity were upset by the variations in the earth's magnetism. These magnets are balanced on a knife-edge or a pair of fine points and are extremely sensitive.

As there was no observer on duty until 8:00 A.M. no estimate can be made of the changes during the interval of greatest disturbance. The actual ranges of the magnetic elements during this storm are therefore unknown.

Two complete magnetographs are in operation at this observatory and are arranged to give continuous photographic records. Each consists of three instruments arranged to give record of the variations in the three elements, declination, horizontal intensity and vertical intensity, respectively. One of the magnetographs, the "Adie," is also fitted with telescopes and scales, so that the position of each magnet may be observed and the actual value of the element determined at any instant. These scales cover a range in the position of the magnet about two and one half times as great as that covered by the paper.

DECLINATION (*West*)

75th mer. time h m	Value ° ′	Remarks
6 39 A.M.	6 29	Off paper.
8 00	6 46	Eye reading.
8 05	8 22	Eye-reading maximum.
8 19	3 25	Minimum.
1 18 P.M.	4 44	
1 52	6 29	
1 58	6 54	
2 38	6 40	
	5 36	Normal value.

HORIZONTAL INTENSITY

75th mer. time h m	Value c.g.s.	Remarks
8 05 A.M.	.17900	Estimated.
9 22	.19680	
10 41	.19187	Eye-reading minimum.
10 52	.19336	
1 19 P.M.	.20343	Eye-reading maximum.
1 58	.19397	
2 38	.19351	Change of 901 gammas in 5 minutes.
2 43	.20252	
2 46	.19481	
3 16	.20301	
	.19878	Normal value.

After 8:00 A.M. eye-readings were secured which show that this is by far the largest storm which has occurred since the records of this observatory began, in April, 1901. The following table will give a general idea of the magnitude of the disturbance.

It will be seen that there was an observed range in declination of nearly 5° and in horizontal intensity of 1,156 gammas and an estimated range of over 2,400 gammas, about one eighth of the horizontal intensity. For comparison, it may be stated that in the storm of October 30–31, 1903, which was the largest recorded at Cheltenham before this one, the range in declination was 1° 37′ and in horizontal intensity about 500 gammas.

J. E. BURBANK

COAST AND GEODETIC SURVEY
MAGNETIC OBSERVATORY,
CHELTENHAM, MD.

SCIENTIFIC BOOKS

SOME RECENT BOOKS ON CHEMISTRY

OF the making of text-books there is no end; this season brings an abundant crop. Of those to be considered in this review two are text-books of inorganic chemistry.

Any book written by Professor Holleman repays close study. The English translation of his "Text-book of Inorganic Chemistry"[1] is well known in this country. It is inorganic chemistry for advanced students written from a physical-chemical standpoint. Some of the best known modern text-books seem mainly concerned with electrolytic dissociation and the phase rule, banish the periodic system to a page or two at the end of the book and—like nearly all our older books—practically ignore thermo-chemistry. As most French books practically ignore everything but thermo-chemistry, it follows that many students can not read a French book on chemistry intelligently. Professor Holleman gives due space to electrolytic dissociation, phase rule and thermo-chemistry, retains the periodic system and applies them all in the text. A student trained by this book can intelligently read any of the present methods of interpreting chemical phenomena. The preface to this edition says:

> The portions on the phase rule, spectroscopy, radioactivity, iron-carbon system and metal-ammonia compounds have been largely rewritten by the author, and the chapters on colloids, experimental determination of equivalent weights and unity of matter are entirely new. Professor Werner has kindly approved the chapter on metal ammonia compounds.

Teachers who do not care to use so advanced a book in their classes will find it invaluable for study and reference.

What has been said of the plan of Holleman's book applies also to the "General Chemistry" of Professor Alexander Smith.[2] It is a broad comprehensive book written in a catholic spirit on the same general lines as that of Holleman. It is somewhat simpler than the latter and better fitted for the American student in arrangement. The book is so well known that it needs no further comment here; its friends will be glad to see that it has appeared in German with an appreciative introduction by Professor Haber.

Of the other books to be considered in this review five are about inorganic preparations and two are manuals of qualitative analysis. These numbers are significant, indicating a general change in methods of laboratory instruction. Making inorganic preparations was an important part of the work in the laboratories of Wöhler, Bunsen and the other great teachers of that time. With the increase of interest in organic work, inorganic preparations were neglected more and more till twenty

[1] "A Text-book of Inorganic Chemistry," by Dr. A. F. Holleman, Professor Ordinarius in the University of Amsterdam. Issued in English in cooperation with Hermon Charles Cooper. Third English edition, partly rewritten. New York, John Wiley and Sons, 1908.

[2] "Einführung in die allgemeine und anorganische Chemie auf elementarer Grundlage," von Dr. Alexander Smith, Professor der Chemie an der Universität Chicago. Unter Mitwirkung des Verfassers übersetzt und bearbeitet von Dr. Ernst Stern. Mit einem Vorwort von Professor Fritz Haber. Karlsruhe i. B., G. Braun, 1909.

years ago there were few laboratories in America or Europe which included them in regular student work. The publication of Erdmann's "Anleitung zur Darstellung inorganischer Präparate" in 1891 marked the beginning of a new era. Similar books quickly appeared in this country and in Germany, each adapted to local conditions. All of these were like Erdmann's first book, simply collections of recipes for making different substances, yet the work was very valuable for many reasons, but chiefly because the students liked it; in the present reviewer's own experience students whose interest in analytic work was languid became deeply interested in the preparations and in some cases the interest once awakened extended to chemistry as a whole, and determined the choice of post-graduate work.

Of late several authors have endeavored to write manuals of preparation on a more scientific basis. The books of the two who perhaps have succeeded best are on our list. Professor Blanchard's little manual[3] is written for beginners and is to precede analytical work. It is a selection of simple preparations of compounds generally of industrial importance. The notes for each exercise are divided into three parts: (1) A discussion of object of exercise and principle of method, (2) explicit working directions, (3) questions for study which involve additional laboratory experiments, the consulting of text-books and original reasoning. It is assumed that the student has an elementary knowledge of the electrolytic dissociation theory and of the principle of mass action. The present reviewer used Professor Blanchard's book with beginners last winter with very encouraging results. The attention of teachers is specially called to this book.

The second book referred to is that of Professors Heinrich and Wilhelm Biltz,[4] whose German manual has been ably translated by Professors Hall and Blanchard. This is a book for chemists and advanced students, not for college students. The authors describe and discuss 171 preparations—few of them easy—divided into seven groups. Group I. contains the elements including reductions by carbon, by aluminothermy, by potassium cyanide, etc. Under group II. changes of condition are considered, including allotropy, passive condition, colloidal state and adsorption compounds. Group III., simple binary compounds. Group IV., compounds containing a complex negative component; such as sodium peroxide, sodium hydrazoate, potassium perchlorate. Group V., compounds containing a complex positive component; including ammonium salts and the metal-ammonia compounds. VI., complex non-electrolytes; including acid-chlorides, esters and metal-organic compounds. VII., preparation of the rare elements from their minerals.

To aid in the study of the theoretic relations brief general discussions are scattered throughout the book, as well as references to the original literature and to text-books of inorganic and theoretical chemistry. The book is admirable; it is by far the best and most thorough work on the subject which has appeared.

The book of Messrs. Hanson and Dodgson[5] treats of inorganic preparations, volumetric and gravimetric quantitative analysis and very elementary qualitative analysis. It is one of those curiously proportioned English books written to enable students to pass a given examination, in this case the London Intermediate Science Examination. While the book is well written and is doubtless well adapted for its special purpose, it can be of little interest to teachers here.

[3] "Synthetic Inorganic Chemistry, A Laboratory Course for First-year College Students," by Arthur A. Blanchard, Ph.D., Assistant Professor of inorganic chemistry at the Massachusetts Institute of Technology. New York, John Wiley & Sons, 1908.

[4] "Laboratory Methods of Inorganic Chemistry," by Heinrich Biltz, University of Kiel, and Wilhelm Biltz, University of Göttingen. Authorized translation by William T. Hall and Arthur A. Blanchard, Massachusetts Institute of Technology. First edition. New York, John Wiley & Sons, 1909, pp. 258.

[5] "An Intermediary Course of Laboratory Work in Chemistry," by Edward Kenneth Hanson, M.A., and John Wallis Dodgson, B.Sc. London and New York, Longmans, Green & Co., 1908.

Professor Lee's book[6] is written for beginners. There are many experiments, most of which are those performed in most laboratories during the first years. Many however would come under the head of preparations, while others are quantitative or physical-chemical. The experiments are well chosen; the only adverse criticism to the book is that while the text is generally very clear and simple, Professor Lee has introduced matter from chemical journals, some of which would be out of place even in a text-book for advanced students. A few omissions and some minor revisions would remove the defects from this otherwise excellent manual.

Professor Stoddard's book[7] is a collection of rough quantitative experiments illustrating the gas laws, gas densities, specific heat, analysis of gaseous compounds and of a number of metal derivatives. The experiments are well selected and are intended for beginners.

The remaining books on our list are two manuals of qualitative analysis, one for colleges the other for schools; the first is by Professor Tower;[8] it is a clear, thorough yet brief exposition of qualitative analysis explaining reactions with help of the theory of electrolytic dissociation. The methods of separation given are very good, Noyes's method of separating antimony and the separation of strontium from calcium by amyl alcohol being the only ones not generally known. The present reviewer has used the Noyes method from the time of its publication and can join Professor Tower in commending it.

[6] "A Text-book of Experimental Chemistry with Descriptive Notes for Students of General Inorganic Chemistry," by Edwin Lee, Professor of Chemistry in Allegheny College. Philadelphia, P. Blakiston's Son & Co., 1908.

[7] "Quantitative Experiments in General Chemistry," by John Tappan Stoddard, Professor of chemistry in Smith College. New York, Longmans, Green & Co., 1908.

[8] "A Course of Qualitative Chemical Analysis of Inorganic Substances, with Explanatory Notes," by Olin Freeman Tower, Ph.D., Hurlburt professor of chemistry, Adelbert College of Western Reserve University. Philadelphia, P. Blakiston's Son & Co., 1909.

Mr. Segerblom's[9] book is much fuller in detail than that of Professor Tower's. It contains no physical-chemical explanations, and no new methods of separation. The separation-methods are arranged in tables and there are many pages of equations; in short the method employed in the more conservative German laboratories forty years ago. The contrast between methods as shown in these two manuals is striking, though doubtless—given a good teacher and a bright student—good results are attained by both.

E. RENOUF

Allgemeine Physiologie. Ein Grundriss der Lehre vom Leben. By MAX VERWORN. Fifth edition, revised. Jena, G. Fischer. 1909. Pp. 742; illustrations 319.

Fifteen years after its first appearance the fifth edition of Verworn's valuable book is now issued. It has here received the most extensive of its successive revisions. The final result of the elimination and addition of matter represents an increase of 158 pages over the first edition and of 90 pages over the fourth edition.

In discussing the method of physiological investigation the author makes an interesting presentation of the logic of causation. Long ago John Stuart Mill said that, philosophically speaking, the cause of a phenomenon is the sum total of its conditions. Yet physiologists are constantly guilty of the logical sin of selecting a single condition and setting it up as *the* cause. Verworn rightly inveighs against this, but goes to the extreme of eliminating altogether from his book the idea of causes of physiological facts. He also takes occasion to rewrite his section on the physical world and mind, and to hammer the vitalists anew. The newer views regarding proteins are presented, following especially Emil Fischer's work. A new section is devoted to the functions of membranes and the osmotic characteristics of cells, while osmotic pressure is

[9] "Laboratory Manual of Qualitative Analysis," by Wilhelm Segerblom, A.B., Instructor in chemistry at the Phillips Exeter Academy. New York, Longmans, Green & Co.

now given its rightful place as one of the important conditions of life on the earth's surface. A paragraph is devoted to the mutation theory.

Many of the revisions in the present edition occur in the chapter devoted to stimuli and their actions. In a rediscussion of the action of light rays on living substance the results of Hertel's work are presented approvingly, and the general conclusions are reached that all living substance is sensitive to light as to heat; that light rays act upon living substance primarily by altering metabolism through reduction processes; and that the question whether the rays of any portion of the spectrum are physiologically active or not, is merely a question of their intensity as radiant energy, combined with the fact that the possibility of the absorption of the rays by organisms is inversely proportional to the wavelength. Brief sections are devoted to the physiological action of Röntgen and of Becquerel rays. The discussion of fatigue is extended. New sections deal with the refractory stage of living substance in its relation to stimuli, and the apparent increase in irritability which living substance experiences in the early stages of stimulation. Great stress is laid on the importance of Fröhlich's explanation of this latter phenomenon. It may well be doubted whether the author has not overestimated the value of this explanation.

The final and heretofore long chapter on the mechanism of life is still further extended in the light of a fuller statement of the biogen hypothesis. New sections deal with the question of the rôle of oxygen in metabolism, the self-regulation of metabolism and the law of mass action, and functional and cytoplastic metabolism. In a revision of the treatment of inhibition the question whether the inhibiting stimulus acts by augmenting anabolism or depressing katabolism is answered in favor of the latter view. Godlewski's experiment, in which non-nucleated pieces of the ovum of a sea urchin were fertilized by the spermatozoa of a crinoid, and the resulting larvæ possessed purely maternal characteristics, is regarded as an *experimentum crucis* demonstrating to a certainty the incorrectness of the theory that the hereditary substance is localized in the cell nucleus. The assumption that the nucleus is the organ of oxidation for the cell is dismissed as "blosse Phantasie."

It is only natural for an author to be best acquainted with, and to look with favor on, the products of his own laboratory and his own country. No one can justly minimize the invaluable contributions of Germany to general physiology. But general physiological research is now strikingly international, and it is to be regretted that in so important a book as Verworn's, the literature has not been more widely canvassed. American, English and French work is sadly neglected. Thus, of the host of American investigators, only nineteen in all are cited, and of those who have contributed during the past ten years of great activity, only eight. Notwithstanding this lack, Verworn's book is still the most comprehensive and stimulating of all works on general physiology.

Frederic S. Lee
Columbia University

The Opisthobranchiate Mollusca of the Branner-Agassiz Expedition to Brazil. By Frank Mace MacFarland. Stanford University Publications, University Series no. 2, 1909. 123 pp., 8vo, pl. i–xix.

During the work of the Branner-Agassiz expedition to Brazil in 1899 a small collection of Opisthobranchiate mollusca was made by Mr. A. W. Greeley, a study of which forms the basis of the present paper. This comprised seven species of which five are regarded as new, one being a *Pleurobranchus* and the others nudibranchiata.

Following the introduction the author gives a list, with references, to thirty species of Opisthobranchs, all yet reported from the east coast of South America. Although this doubtless comprises only a moiety of the species which may be expected to occur and is too small to base extended generalizations upon, yet it indicates a fact already definitely shown by collections of other groups of mollusks—that the Antillean fauna extends for a considerable distance southward along the coasts of Brazil without interruption by the fresh waters of the Amazon, which points to the

further conclusion that the present distribution of the litoral fauna was completed before the Amazon bore its present geographical relations. If it were otherwise the vast mass of the river waters would have formed an insurmountable barrier to the southward extension of marine forms living in shallow water.

The main body of the paper consists in an anatomical study of two species of *Tethys* and the new species above referred to. The investigation is carried out in great detail, the most noticeable feature in the genus *Tethys* being the determination of nerves issuing from the pleural ganglion and anastomosing with pedal nerves in each case, contrary to the results announced by some investigators from studies of Mediterranean species of *Tethys*. Excellent figures are given of the anatomy, especially of the nervous and alimentary tracts, and comparisons instituted with the results of other investigators. On the whole the paper is creditable to the author and to the university under whose auspices it appears, and will prove, we hope, the forerunner of other contributions to a subject which has hardly received hitherto its proper meed of attention. WM. H. DALL

SUMMARIES OF FOUR OPINIONS (6, 7, 8, 12) BY THE INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE

THE following summaries of recent opinions by the International Commission on Zoological Nomenclature are published for the information of persons interested in the points in question. It is expected that the full details of the arguments will be published later in connection with certain other cases now under consideration. These summaries do not give the reservations made by certain commissioners, but these reservations will be presented in the final publication.

6. *Genus* A *Linnæus, 1758, with two species* Ab *and Ac.*—When a later author divides the genus *A*, species *Ab* and *Ac*, leaving genus *A*, only species *Ab*, and genus *C*, monotypic, with species *Cc*:

The second author is to be construed as having fixed the type of the genus A. [See Article 30.]

Vote: Affirmative 14; negative 0; not voting 1.

7. *The interpretation of the expression* "n. g., n. sp." *under Article 30 (a).*—The expression "n. g., n. sp." used in publication of a new genus for which no other species is otherwise designated as genotype, is to be accepted as designation under Article 30 (a).

Vote: Affirmative 9; negative 4; not voting 2. [As the vote on this case is not unanimous, the point in question may possibly come up for consideration at the next meeting of the commission.]

8. *The retention of* ii *or* i *in specific patronymic names, under Article 14 (c) and Article 19.*—Specific patronymics originally published as ending in *ii* (as *schrankii, ebbesbornii*) are, according to Article 19, to be retained in their original form, despite the provision of Article 14 (c) which provides that they should have been formed with only one *i*.

Vote: Affirmative 11; negative 2; not voting 2. [As the vote on this case is not unanimous, the point in question may possibly come up for discussion at the next meeting of the commission.]

12. *Stephanoceros fimbriatus (Goldfuss, 1820) vs.* S. eichhornii *Ehrenberg, 1832.*—The generic name *Stephanoceros*, 1832, is to be used in preference to *Coronella*, 1820 (preoccupied, 1768); the specific name *fimbriatus*, 1820, takes precedence over *eichhornii*, 1832, which is admittedly (Ehrenberg, 1832b, 125, and 1838a, 400–401) *fimbriatus*, 1820, renamed. Ehrenberg was right in rejecting *Coronella*, 1820, but in error in rejecting *fimbriatus*, 1820; no reason is apparent for perpetuating his error.

Vote: Affirmative 14; negative 0; not voting 1.

C. W. STILES,
Secretary of Commission

SPECIAL ARTICLES

CARBON DIOXIDE AS A FACTOR IN HEART BEAT

CARBON dioxide when distributed uniformly in the blood in large quantities exerts a definite injurious effect on the heart. In the normal circulation, however. the right heart

contains about eight volumes per cent. more CO_2 than the left heart. It seemed to us that the electromotive force resulting from the difference in potential might exert an influence differing from the ordinary pharmacological action of the carbonates and be, at least, a factor in the maintenance of heart beat.

The exact condition of the CO_2 in the blood is not known. The fact that part is in solution and part is in combination renders a mathematical presentation only approximate.

Eight volumes per cent. CO_2 equals 80 volumes per liter. Calculated from H as 0.0896 grams this would equal 1.9712 grams CO_2 and equal 2.7777 grams of H_2CO_3, or approximately the equivalent of $N/10$ H_2CO_3 between the left and the right sides of the heart. Assuming this to be ionized we should have an electromotive force represented by the formula below.

(Jones) $$\pi = .0002 \frac{u - v}{u + v} T \log \frac{C_1}{C_2}$$

at 25° C. or since the valence of the positive negative ions may vary

(Jones) $$\pi = \frac{\frac{c}{v} - \frac{a}{v'}}{c + a} 0.0002 T \log \frac{P_1}{P_2}.$$

To test the theory we perfused several mammalian hearts (cats') with blood oxygenated on one side and carbonated on the other. The technical difficulties of keeping the two separate were not completely overcome, but sufficiently so to convince us that there was no effect aside from the usual carbonate action.

Parts of the turtle ventricle or the whole heart was split so that each end could be immersed in a separate saline bath through which CO_2 and O could be forced. One end was bathed in CO_2 and the other in O. The whole was so arranged that a tracing could be recorded.

The results obtained were no different from those with the mammalian heart. The addition of $NaHCO_3$ gave the same action irrespective of whether it was added to either or both sides of the heart. Our results would indicate that the difference in CO_2 between the left and right sides of the heart has no influence on the rate or strength of the beat of the isolated organ.

This does not preclude the probability that CO_2 has an influence direct or indirect on the heart beat of the intact animal. Its known action on the dissociation of hemoglobin and the probable similar action on other salts renders the view highly probable that carbon dioxide is a factor in the automatism of the heart.

Hugh McGuigan,
R. H. Nicholl

St. Louis,
October 6, 1909

The Influence of Chemicals in Stimulating the Ripening of Fruits

Various chemical and physical methods of bringing on latent physiological processes in plants have long been known. Buds have been brought into full blossom for commercial purposes weeks before their natural time by the application of anesthetics, and Molisch has lately accomplished the same result by the use of hot water. The Arabs have also applied cloths moistened with vinegar to bunches of dates in order to "sweeten up" retarded fruits.

Following this lead, the writer has succeeded in ripening the fruit of a seedling date into a perfect commercial product in less than three days. The flavor of the chemically stimulated fruit is fully equal to that of the best naturally ripened, and a much greater evenness of ripening is obtained than when left on the tree. The sprays of fruit are subjected to the vapor of acetic acid for twelve or fifteen hours. At the end of this time they have become transparent nearly to the seed and will then ripen naturally without further treatment. The process can be accelerated by exposing them to sunshine, or more rapidly by heating for some hours to forty-five degrees centigrade. The process, it is anticipated, will permit the shipping of dates green and ripening them at their destination as bananas are now handled.

The fresh ripe date is very soft and prone to sour quickly, while the unripe fruit is very firm and not easily bruised. Furthermore, the

ripe, fresh date deteriorates very rapidly in flavor, due largely to the inversion of the cane sugar. For example, the unripe fruit of the seedling used in these experiments contains fifteen or twenty per cent. of cane sugar when ready to ripen, but very soon after complete ripeness this cane sugar disappears. This is due to the release of the intracellular invertase at the time of ripening. Much of the fine quality of the delicious Deglet Noor date is due to the nearly complete absence of invertase, which allows the cane sugar to remain permanently as such. By artificial ripening at their destination, the more inferior invert sugar varieties can be placed upon the table of the distant consumer with their maximum quota of cane sugar and consequently of flavor.

After moderate treatment with acetic acid, the tannin of the date has not yet become entirely insoluble but all astringency disappears in the next few hours. The intracellular invertase, however, passes into solution to quite an appreciable extent immediately after the treatment, and probably other intracellular or insoluble catalytic agents, are released simultaneously. The ripening processes are initiated not only by acetic acid, but also by a number of other chemicals such as acetic ether vapor, which acts practically as well as acetic acid but greatly impairs the flavor. Soaking some hours in a solution of potassium acetate stimulates the process in a very marked way but ammonium acetate has very little effect. Potassium sulphate shows no action. Oxalic acid shows a slight effect, while its homologue, succinic acid, has a very marked action. Benzoic and salicylic acids, and the acid amides (at least as regards acetamid) act promptly. The vapor of hydrochloric acid is without effect, but dates exposed to this acid for two days responded to acetic vapor. A detailed study of the effects of various groups of reagents is being made and the results will be published as soon as completed.

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NOTES ON THE PARASITISM OF CYTODITES NUDUS AND HÆMAPHYSALIS CHORDEILIS[1]

I. *Cytodites nudus.*

Among the many varieties of acariasis found in the United States, that produced by *Cytodites nudus* is comparatively rare. Furthermore, in the cases where *Cytodites* has been mentioned in this country, in Europe and in Australia, it has usually been described as a parasite of the trachea, lungs, air sacs and other respiratory passages of fowl and pheasants. Gerlach,[2] however, has attributed to it enteritis of poultry, and Zundel[3] considers these mites as the causative agents of enteritis and peritonitis, and Holzendorff[4] also found *Cytodites* embedded in the liver and kidneys of diseased fowls. It is the purpose of the present note to describe the conditions of infection observed by the writer in two cases of acariasis caused by *Cytodites nudus,* occurring in the yards of the Rhode Island Agricultural Experiment Station at Kingston.

The first case was that of a female golden pheasant. On December 21 it was observed that the bird was unable to walk, ate little, and showed a slight diarrhea. On December 22 a dose of castor oil was administered. From this time on the bird failed in strength, but lost very little flesh until it died on January 4, on which date the *post mortem* examination was made.

The internal organs were, as a whole, normal, except for the lungs, which were slightly congested. The heart was normal, though the most of the pericardial fluid appeared to have escaped into the thoracic cavity. Inside the pericardium, and on the surface of the heart itself, were a large number of round whitish bodies, about .5 mm. in diameter, which were recognized upon microscopic examination as identical with *Cytodites nudus.* Upon

[1] Contribution No. 6 from the Division of Biology of the Rhode Island Agricultural Experiment Station, Kingston, R. I.

[2] Gerlach, *Magazin für Thierheilkunde,* Berlin, 1859.

[3] Zundel, *Journ. de Med. Veterinaire,* Lyons, 1864.

[4] Holzendorff, *Archiv für wissensch. und prakt. Theilk,* 1885.

further examination these organisms were found in the air sacs, being especially numerous in the interclavicular. Upon examining the abdominal cavity it was found that, while the proventriculus, gizard, spleen, pancreas, ovaries, ceca, duodenum and small intestines were normal, the gall bladder was perforated at several points, so that the fluid had spread into the abdominal cavity. On the surface of the gall bladder, and on the surface of the liver, spleen, kidneys and intestines, as well as on the mesenteries and peritoneum, great numbers of *Cytodites* were found. It seems very probable that death was caused by these mites, which had, in this instance, perforated both the pericardium and the wall of the gall bladder.

The second case of infection with *Cytodites* was that of a fowl coming from a private poultry yard near the experiment station. This bird also had been sick for several days, and finally died on January 7. The conditions found upon *post mortem* examination were similar to those described above except for the fact that the gall bladder and the pericardium were not perforated, and the number of *Cytodites* clustered on the internal organs was much greater than in the case of the pheasant.

II. *Hæmaphysalis chordeilis.*

Although members of the genus *Hæmaphysalis* have not been uncommon in the southern states, their occurrence in the northern states is far less common. While *Hæmaphysalis chordeilis* has been reported by Banks[a] as having been found on a nighthawk, caught at Milton, Mass., and from a turkey at Taftsville, Vt., there is no case on record in which this parasite has in a single locality increased in numbers so as to be a menace to the raising of domestic poultry. The purpose of the present note is to place on record a case of this sort occurring in June, 1909, at Norwich, Vt.

At this time the attention of the Rhode Island Agricultural Experiment Station was called to the case of Mr. A., of Norwich, whose turkeys were dying as the results of the parasitic attacks of a large tick. The writer secured specimens which were identified by Dr. Banks, of the Bureau of Entomology, and by Professor Barlow, of the Rhode Island State College, as *Hæmaphysalis chordeilis.* Further data regarding the outbreak are given below:

The ticks were first observed by Mr. A. in the later part of May, when his young turkeys were about one week old. Then the parasites were found especially in the region of the neck, where they seemed to do most of their biting and sucking. Most of the birds that were infested carried from seventy to eighty full-grown ticks, as well as many more immature forms. In order to rid his birds of the ticks, Mr. A. tried insect powders without avail. He then tried lard and kerosene oil, but found that it did no good; indeed, "when the ticks were put into it they lived for seven days." Finally he got rid of them by picking them off the young birds, but not until forty of a flock of forty-six young turkeys had died.

The source of this infection is not known. It appears probable, however, that it entered Mr. A.'s flock with turkeys which he bought early in the spring. Mr. A. had no fowls, so they could not have been the source of the trouble. The above hypothesis gains evidence from the fact that Mr. A. sold some of his recently purchased turkeys to a neighbor, in whose flock the ticks also subsequently appeared.

One interesting consideration in connection with the present case is that Dr. Banks reported *Hæmaphysalis* from Taftsville, Vt., only a few years ago. Mr. A. states that he never received any birds from Taftsville, but it is apparent that the interchange of poultry stock in Vermont gives ample opportunity for the dissemination of this destructive parasite.

In order to prevent further spread it would seem important that the center of infection be located and proper measures taken to stamp out the trouble before the parasite enters other regions of the state of Vermont, or is disseminated into adjoining states.

Philip B. Hadley

[a] Nathan Banks, "A Revision of the Ixodidæ or Ticks of the United States," Bulletin No. 15, Bur. Entomol., U. S. Dept. Agriculture, 1908.

THE WINNIPEG MEETING OF THE BRITISH ASSOCIATION

SECTION H—ANTHROPOLOGY

FOR twenty-five years it has been the policy of the British Association for the Advancement of Science not to confine its annual meetings to the British Isles. Pursuant to this truly imperial policy a meeting was held in Winnipeg, Manitoba, August 25 to September 1, 1909. This was the third meeting on Canadian soil, the first having been held at Montreal in 1884, and the second at Toronto in 1897. To the Winnipeg meeting the officers of the American Association for the Advancement of Science were invited as guests, while a general invitation was extended to all its members and fellows. These invitations were not only very highly appreciated, but also accepted by a considerable number of American men of science who are only too glad of an opportunity to attend a meeting of the British Association without being compelled to cross the Atlantic.

By a curious coincidence the anthropological interests of each association are represented by a Section H, which had held its first meeting in Montreal—that of the American Association in 1882 and that of the British Association in 1884. The sectional president at Winnipeg was Professor John L. Myres, of the University of Liverpool. The full text of his address on "The Influence of Anthropology on the Course of Political Science" has appeared in *Nature* of September 23. In it he emphasizes the double place held by anthropology in the general scheme of knowledge. On the one hand it may be considered as a department of zoology, or geography; on the other as embracing whole sciences such as "psychology, sociology, and the rational study of art and literature." From ancient Greece, the renaissance, and the periods of great discovery and colonization, numerous authors were cited "to show how intimately the growth of political philosophy has interlocked at every stage with that of anthropological science." The history of the subject for the last fifty years shows how European colonization and anthropological discoveries have united to establish a matriarchal theory of society as a rival of the patriarchal, and then to confront both with the phenomenon of totemism. Anthropology may yet furnish the facts about human societies that will make it possible for the student of political science to measure the forces which maintain or destroy states. The address closed with a strong plea for an ethnological survey of Canada before it is too late.

The reports of various committees formed an important part of the program. The committee appointed to investigate the lake villages in the neighborhood of Glastonbury reported that owing to the amount of work required in compiling and arranging the details of the monograph on Glastonbury lake village, it was found inexpedient to resume excavations this summer on the new site at Meare. The expenses incurred in the preliminary excavations carried on at Meare last summer have already been paid by Mr. Bulleid, and, consequently, no part of the £5 grant made by the association has been expended. The committee have, therefore, to recommend that this grant be renewed, together with at least £30 in addition. With a sum of £35 assured, and the number of private contributions already announced, the committee hope to make considerable progress in excavating the Meare lake village during the summer of 1910. Judging from the discoveries already made and recorded (Tenth Report, Dublin Volume, p. 414), this new lacustrine site promises to be richer in archeological remains than even Glastonbury.

The committee appointed to ascertain the age of stone circles have obtained evidence bearing on the probable date of the monument at Avebury, which is ascribed to the neolithic period. Sectional and other plans of all the parts excavated have been prepared with great care and a large number of photographs were taken. The grant of the association, together with most of the money raised by subscriptions, having been expended, the committee ask for a new grant of £75, and for reappointment with leave to invite subscriptions commensurate with the costliness of the excavations due to the huge scale of the earthworks.

The committee appointed for the collection, preservation and systematic registration of photographs of anthropological interest, reported that, as no grant was made to it last year, and the balance in hand has all been expended, no additions to the collection have been made since the last meeting of the association, as it is useless to accept prints for the collection, if it is not possible to mount and store them. The committee, first appointed in 1899, has received nothing beyond the initial grant of £10, which has now all been expended. Over 1,000 photographs have been received and mounted, while in addition to this other collections, numbering some 3,000 subjects,

have been registered, catalogued and made available to students.

President Myres reported for the committees on excavations of Roman sites in Great Britain and on the preparation of a new edition of "Notes and Queries on Anthropology." The latter will appear within the coming year.

The committee on archeological and ethnographical researches in Crete presented the following *interim* report from Mr. C. H. Hawes, who was able to return to Crete in the spring of 1909. In view of the important results outlined in this report, and of the possibility of a longer stay in Crete than Mr. Hawes originally contemplated, the committee asks to be reappointed, with a further grant.

REPORT FROM MR. C. H. HAWES

A piece of good fortune was met with at the opening of this season's work. During October, 1908, four skulls, two portions of other crania, several pelvic and long bones, came to light in the course of deepening a well in the alluvial bank of an ancient river ten minutes east of Candia. The argillaceous deposit in which they lay had acted as a natural plaster of Paris, and we are now in possession of human osseous remains of not later than the Middle Minoan I. period, in the most extraordinary state of preservation. Complete measurements and observations have been made upon these, and I hope to publish them at an early date with a comparison of those discovered by Dr. Duckworth in 1903.

In attacking the problem of how to discover or uncover the ancient stratum among the modern people, I have addressed myself to the task of finding out and isolating, if possible, alien elements of historical times. Representatives of Turkish and old Venetian families have been approached, and genealogical, traditional and historical information garnered, with a view of testing them anthropometrically. For example, one village at which I am to stay this week claims to contain only descendants of Venetians who have strictly refused exogamous marriages. A small Armenian colony has existed in Candia since the Turkish occupation in 1669, and inasmuch as the Armenoid type of head is met with in the east end of the island, whether of historic or prehistoric date, this little band of settlers is being measured. Albanian influence has been suspected in Crete, and rightly so, since for various reasons the Turkish Janissaries in the island included large numbers of these Europeans, and considerable mixture resulted. In view also of the Dorian occupation of Crete and the belief in certain quarters that Illyria largely furnished the Dorian hosts, it seemed important to get at the Albanian type. Records of these and other peoples to be met with in the island were in my possession, but I was anxious to attempt the method of race analysis by contours of the living head. During my short stay at Athens I was able, by the aid of Mr. Steele, of the Lake Copais Company, to pay a flying visit to an Albanian village in the mountains to the northeast of the lake. There, in the village of Martino, reputed to be the purest of five such, I measured forty individuals and obtained contours of their heads by means of an instrument which I had just completed.

The problem has been attacked from another direction. What modification of the cephalic index and the shape of the head has been effected by artificial deformation or formation of the head? I am indebted to Professor Macalister for calling my attention to the importance of this factor. It is a custom which is far more prevalent than is dreamed of, and thousands of people in this island, mostly of the male sex, are unaware of a custom which is universal except among the Mussulmans and the better educated minority of urban population. As to the reason and methods of such head shaping, I hope to enter into details in a separate paper. The first object was to gauge the effect on the cephalic index and the contours. At the outset it is necessary to distinguish between the results of intentional formation and involuntary deformation due to the lying on hard surfaces. For these purposes I am making comparisons between subjects who have and have not undergone head shaping, and between those who have and have not suffered from a pillowless infancy. Striking examples of the latter are to be found among the small colony of Epirote bakers, who, owing to the extreme poverty of their parents at home, the circumstances of which I shall enter into more fully elsewhere, possess the most extraordinary and incredible head-shapes it has been my lot to see. Similar observations are being made upon the Armenian settlement here. Observations on these two extreme forms of head will prove instructive in comparison with the results of similar, though modified, treatment of the Cretan native. Further, whole families of Cretans are under observation, and measurements and contours have been taken of them, including children who have and have not been bandaged in their infancy, from the age of fourteen days up.

In addition to these researches which are in

progress, I have been able to garner from a cave, where are carelessly consigned the bones of many a deceased Cretan of to-day after a short burial in the cemetery, some hundred bones from all parts of the skeleton, saving, unfortunately, the cranium; and thus a comparison is possible between skeleton and skeleton of ancient and modern times. Two collections of hair, representing a series of shades, have been made for me by Orthodox and Mussulman barbers in Candia.

Crete appears to me to be a more than ordinarily instructive and significant field of research, and I hope that in the short time at my disposal I may find answers to some of the many questions which open up at every turn.

The committee to conduct archeological and ethnological investigations in Sardinia report as follows: Dr. Duncan Mackenzie, honorary student of the British School at Rome, returned to Sardinia at the end of September, 1908, and stayed there till the middle of November. He was accompanied for part of the time by the director, Dr. Thomas Ashby, and by an architectural draughtsman, Mr. F. G. Newton, student of the school.

Their new observations have materially increased our knowledge of the two main groups of Sardinian megalithic monuments, the Nuraghi and the "Tombs of the Giants." The previous year's work made it clear that the former were fortified habitations. Dr. Mackenzie has now visited other examples and recorded variations of type and peculiarities of construction. The most remarkable is the Nuraghe of Voes in the Bitti district towards the north of Central Sardinia. Triangular in plan, it contains on the ground floor circular chambers with bee-hive roofs; the usual central chamber and one in each of the three angles. The entrance is on the south and leads into a small open court with a doorway at each side leading to the chamber at the base of the triangle, and another doorway straight in front by which the central chamber is entered. There was an upper story, now destroyed, reached by a stairway of the usual type. Exceptional features are two long curving corridors in the thickness of the wall on two sides of the triangle, intended probably as places of concealment. Above them were others of similar plan, but both series are so low that the roof of the upper one is level with that of the bee-hive chamber on the ground floor. This skilfully planned stronghold must have been built all at one time; other large Nuraghi were originally of simpler design, and have grown by the addition of bastions and towers.

A new type of Nuraghe was discovered at Nossia near the modern village of Paulilatino, in Central Sardinia. It is a massive quadrangular citadel of irregular rhomboidal plan with a round tower at each corner. These towers resemble the stone huts of the villages attached to some of the Nuraghi; they are entered from a central courtyard which here takes the place of the normal bee-hive chamber. It was partly filled with circular huts, so that this Nuraghe must be regarded as a fortified village rather than as the castle of a chieftain.

The dwellers in these Nuraghi buried their dead in family sepulchers popularly known as Tombs of the Giants. Several writers had suggested that these tombs with their elongated chamber and crescent-shaped front were derived from the more ancient dolmen type, but hitherto there was little evidence to support this conjecture, only one dolmen being known in Sardinia. Dr. Mackenzie has now made this derivation certain; he has studied ten important groups of dolmen tombs, most of them entirely unknown, which furnish a series of transitional types. In one case the chamber of an original dolmen tomb had at a later period been elongated so as to resemble that of a Giant's Tomb. In another example the large covering slab was supported by upright slabs at the sides and back; and behind it there are traces of an apse-like enclosing wall, such as is characteristic both of the Giants' Tombs and also of dolmens in certain localities where Giants' Tombs do not exist; for example, in northern Corsica and in Ireland. Dr. Mackenzie also discovered a new type of Giant's Tomb in which the mound was entirely faced with stone, upright slabs being used below and polygonal work above. Another feature, hitherto unique, is a hidden entrance into the chamber at one side, in addition to the usual small hole in the center of the front through which libations and offerings were probably introduced.

These results were described at a meeting of the British School at Rome in March, 1909 (see *Athenæum* of March 27). An illustrated report of them will appear in volume V. of the *Papers* of the school.

Dr. Mackenzie and Mr. Newton intend to go to Sardinia, in September, for six weeks in order to continue the exploration of the island. The importance of anthropometrical work in connection with the problems presented by the early civilization of Sardinia was pointed out in a previous report of this committee. Mr. W. L. H. Duck-

worth, a member of the committee, went to Rome last April and studied the collection of one hundred Sardinan crania in the Collegio Romano. He made about 1,200 measurements, and is preparing a report which will serve as a basis of comparison with any collection of ancient crania that may be obtained. In addition to these specimens, which had not been described previously, Mr. Duckworth has examined about thirty Sardinian crania in the museums of Rome and Paris. He has recently spent ten days in Corsica, where he obtained valuable illustrative material, and hopes to take part in Dr. Mackenzie's expedition to Sardinia in September next.

The committee ask to be reappointed, and apply for a grant.

Although the last report of the committee on anthropometric investigation in the British Isles was considered to be final as regards the method of anthropometric investigation, it was thought advisable to reappoint the committee to act as an organizing center to promote the establishment of anthropometric investigation among all classes of the population of the British Isles. In this direction important work has been done during the past year.

In October last, the secretary, at the request of Dr. Rawson, the principal of Battersea Polytechnic, instructed his medical officer in the method of carrying out measurements in accordance with the committee's scheme.

The importance of installing anthropometry in public schools was brought under the notice of the Headmasters' Conference on February 10 last, and their cooperation was asked for. In reply, a letter, dated May 21, was received from the secretary of the Headmasters's Conference committee, suggesting the issue of a short circular explaining the items of information that it was most important to collect. In response to this suggestion a memorandum was drawn up and sent out by the anthropometric committee to the headmasters of 107 public schools. It is hoped that this action will result, in the course of time, in the general establishment of anthropometry in public schools.

Measurements are now being carried out generally under the direction of the medical officers of the education authorities, in primary schools, and in a certain number of provided secondary schools. But there is still a wide field among secondary schools for both boys and girls in which the committee could do good work.

The 1908 report of the committee on anthropometric method has been issued as a separate publication by the Royal Anthropological Institute (price, 1s. net). This will make the scheme of the committee available, in cheap and convenient form, to all who propose to undertake anthropometric work, and will ensure the uniformity which is so essential to make the results of different measurers comparable.

The committee recommend that they should be reappointed, with a grant of £5 for printing or typing circulars, postage, stationery, etc.

The work of the committee on the establishment of a system of measuring mental characters is going forward and promises to yield interesting results, but is not sufficiently advanced for a full report.

The committee ask to be reappointed, and that a grant of £5 be made to them for printing cards and other inevitable expenses.

President Myres reported for the committee to investigate neolithic sites in northern Greece. The work has been done by the Liverpool Archeological Institute. The mounds of southern Thessaly are found to be the accumulations of successive village sites. This region was occupied by a neolithic population that formed an effective barrier between the Mediterranean civilization on the south and that of the Danube valley on the north, and lagged behind both. At the top of one of these mounds were found bronze age graves of an Ægean people. Only a few mounds have as yet been opened, while hundreds remain untouched.

The papers presented covered a wide range of subjects. A majority of these are given in abstract.

Miss A. C. Breton described "Race Types in the Ancient Sculptures and Paintings of Mexico and Central America." The different race types in the ancient sculptures and paintings found in Mexico and Central America form an important anthropological study. An enormous mass of material, evidently of many periods, includes sculpture, archaic stone statuettes, the portrait statues and reliefs at Chichen Itza, the Palenque reliefs and the series of magnificent stelæ and lintels at Piedras Negras, Yaxchilan, Naranjo, Copan, Quirigua, etc.

In terra cotta or clay there are the hundreds of thousands of small portrait heads and figurines found at Teotihuacan, Otumba, the neighborhood of Toluca and other ancient sites. Larger clay figures have been found in quantities in tombs, as in the states of Jalisco and Oaxaca; these were made as offerings, instead of the sacrifice at a

chief's burial of his wives and servants. Small jadeite heads and figures, also found in tombs, show strongly marked types. If there are few specimens in gold, it is because throughout the country the Spaniards ransacked the tombs for gold. In painting there are the picture manuscripts, the fescoes at Chichen Itza, Chacmultun and Teotihuacan and a number of vases with figures from Guatemala and British Honduras.

This material is now available for students in Mr. A. Maudslay's "Biologia Centrali-Americana, Archeology," Dr. E. Seler's collected works, the publications of the Peabody Museum, and the reproductions of the Codices by the Duc de Loubat, also in the splendid collections of the Museum für Völkerkunde at Berlin, the Mexican Hall of the Natural History Museum at New York and the Peabody Museum.

Among distinctive types are: the chiefs in the reliefs at Xochicales, who sit cross-legged; the little shaven clay heads at Teotihuacan; the tall, well-built priests, with protruding lower lip, of the Palenque reliefs; the fifteen caryatid statues in feather mantles, of the Upper Temple of the Tigers, at Chichen Itza; and the sixteen stern warriors carved at its doors, these last similar in type to some of the modern Indians of the villages near Tlaxcala.

There are portraits of the Mexican kings on the border of a picture-map which represents the western quarter of Tenochtitlan, and of the householders in that part of the city. Of female types there are the painted clay figures of Jalises with compressed heads. Some of them have short, broad figures, others are slender. Both types still survive. The queenly women in Codex Nuttall-Zouche, and the women-chiefs of the Guatemalan stelæ belonged to a different caste to the obviously inferior women on those stelæ, fattened in preparation for sacrifice.

Herr T. Maler's most recent explorations on the borders of Guatemala have given magnificent results in the finding of thirty-seven stelæ at Piedras Negras, and at Yaxchilan twenty stelæ and forty-six sculptured lintels. The superb figures of warriors and priests indicate a race of men of tall, slender stature and oval face, with large aquiline nose, whilst the captives appear to be of a different race.

A second paper by Miss Breton dealt with the "Arms and Accoutrements of the Ancient Warriors at Chichen Itza." Chichen Itza, in Yucatan, is as yet the principal place in the region of Mexico and Central America where representatives of armed warriors are found. There was a remarkable development in the later history of the buildings there of painted sculptures and wall-paintings, mostly of battle scenes and gatherings of armed chiefs.

The stone walls of the ruined lower hall of the Temple of the Tigers are covered with sculptured rows of chiefs, who carry a variety of weapons. Of the sixty-four personages left, half a dozen have ground or polished stone implements; others hold formidable harpoons (two of them double) or lances adorned with feathers; whilst the majority have from three to five spears and an atlatl (*i. e.*, throwing stick). These are of different shapes. One figure has armlets with projecting rounded stones. Some have kilts, sporrans, leggings and sandals. Eleven personages have tail appendages. There are protective sleeves in a series of puffs, breastplates, helmets and feather head-dresses, necklaces of stone beads, masks, ear and nose ornaments in variety. Small round back-shields, always painted green and fastened on by a broad red belt, may have been of bronze attached to leather, as a bronze disc has been found. Round or oblong shields were carried by two thongs, one held in the left hand, the other slipped over the arm.

The two upper chambers of the same building have reliefs on the door jambs of sixteen warriors life size. They carry a sort of boomerang in addition to spears and atlatls. In the outer chamber was a great stone table or altar, supported by fifteen caryatid figures. Upon its surface was a relief of a standing chief, holding out his atlatl over a kneeling enemy who offers a weapon. The walls of both chambers were covered with painted battle scenes, in which several hundred figures are still visible. They carry spears, atlatls, round or oblong shields, and a kind of boomerang which was used by the natives in Australia about eighty years ago. It was intended for striking rather than throwing. On one wall the method of attacking high places by means of long notched tree-trunks as ladders and scaffold towers is shown.

The building at the north end of the great Ball Court is evidently very ancient, and its sculptured walls have chiefs with spears and atlatls. The temple on the great pyramid called the Castillo also has warriors on its doorposts and pillars, with boomerangs, spears and atlatls, and so has a building in the great Square of Columns. In an upper chamber of the palace of the Monjes are paintings in which are men with spears and atlatls, and also spears with lighted grass at-

tached thrown against high-roofed buildings. A survey of all that has so far been discovered at Chichen gives a vivid idea of primitive battle array.

One whole day was devoted to papers and discussion relating to a proposed ethnographical survey of Canada. Mr. E. Sidney Hartland began with a "Retrospect" which told of the state of culture encountered by the French when they took possession of the territory in the seventeenth century and which reviewed the work that has been carried on since then by men as well as institutions.

Professor Franz Boas, whose investigations in the Canadian field of anthropology are of the first importance, summed up the "Ethnological Problems of Canada." In the past twenty years a general reconnaissance has been made largely through the influence and financial aid of the British Association. The time has come to concentrate attention on specific regions and problems. Many of the general problems embrace the whole of the western hemisphere, such, for example, as the wide distribution of Indian corn and the angular character of the art. The culture of the American Indians is remarkably uniform in comparison to that of Africa or Australia. The continent may be divided into a central, marginal, isthmian and an island region. The Canadian aborigines belong to the northern marginal culture. The origin of the Iroquois is placed in the southern Appalachian Mountains, although at the time of the discovery they occupied the lower St. Lawrence. The Iroquoian language has nothing in common with Algonquian, Siouian or Eskimo. On the other hand, it resembles the Pawnee and the tribes of the southwest. The blow gun of the Iroquois seems to connect them with the peoples of the Gulf of Mexico and of South America. The Iroquois, therefore, do not belong to the northern marginal culture. The Cree (Algonquin) of Labrador have migrated as far west as Kamloops, B. C., and isolated Athabascan tribes are found along the Pacific coast. Lack of intensity of the Athapascan culture accounts for the readiness with which it is influenced by contact with neighboring cultures. The Alaskan Eskimo came in recent times from northeastern America instead of from Asia, as was formerly believed. On the other hand, that there has been close contact between Siberia and northwestern America is suggested by house forms and in other ways. One of the problems is to trace the northwestern limit of the use of pottery.

An "Ethnographic Study of the White Settlers" was discussed by Dr. F. C. Shrubsall, who spoke of what was being done to improve the breeds of live stock and the varieties of grain in contrast with the lack of interest shown in the improvement of the human race. The speaker urged upon the government the importance of taking preventive measures while the dominion was still young as a means of avoiding the necessity of remedial measures which confront the peoples of the old world.

Dr. G. B. Gordon contributed two papers on American anthropology. The first of these was a review of the researches into the history of man on the North American continent that have been carried on under the auspices of the government and institutions of the United States. He called attention to certain far-reaching changes that have been witnessed in the attitude of the educated classes and especially of the institutions of learning with reference to those studies that fall directly within the province of anthropology, changes which it is believed are destined to affect very profoundly those interrelated branches of learning, which, like history and sociology, are most directly affected by the anthropological method. These tendencies are made manifest by the history of anthropological activities in those quarters that are most influential in shaping educational development and methods of research.

The work of the Smithsonian Institution through the Bureau of Ethnology has been a prominent factor in promoting that interest in the study of the native races which has been carried on with successful results by the great universities and museums of the country. Nothing in the history of anthropology is more significant than the present condition of archeological studies in the great universities as contrasted with that which obtained a few years ago. Until very recently the name of American archeology was obnoxious because it was foreign to European civilization. To-day in the same quarters the chief archeological interest lies in the prehistoric period; and with a realization of the unity of all problems of human development comes a rapidly increasing interest in American archeology as a subject of study. This is the condition of archeological science in American institutions of learning to-day; and as an index of this condition the Archeological Institute of America, which for many years has maintained schools at Athens, Rome and Jerusalem has only last year established a similar school in New Mexico and is

making an effort to establish another in the City of Mexico, the object of these two schools being the study of American archeology.

After reviewing the work done by Harvard, Yale, Columbia, the University of California, the University of Pennsylvania, the American Museum of Natural History and the Field Museum of Natural History, Dr. Gordon called attention to the services rendered to anthropology by private individuals and paid a special tribute to Mr. George G. Heye, of New York, whose collections of American archeology and ethnology assembled during the last two years may be compared in magnitude and importance with those assembled during the same period by some of the larger museums. The result achieved in this instance may serve to indicate what may be done in American archeology in a short time by one man who is possessed not only of the necessary means, but also the necessary energy intelligently directed. These splendid collections are now being installed in the University of Pennsylvania Museum, where Mr. Heye has been elected chairman for American anthropology on the board of managers in recognition of his conspicuous services to science.

In similar terms the speaker referred to the archeological work done by Mr. B. Talbot B. Hyde among the ruined pueblos, where a splendid collection of pottery and other art objects was obtained, which has been divided between the American Museum of Natural History in New York and the University Museum in Philadelphia.

Dr. Gordon's second contribution was based on his "Ethnological Researches in Alaska." In 1907 he made an expedition on behalf of the University of Pennsylvania Museum into the Koskokwim Valley in Alaska to investigate the natives of that region, who, owing to the remoteness of their habitat from the white man's influence, preserve in a marked degree their aboriginal characteristics. The route followed was from Dawson westward by way of the Tanana and Kantishna rivers to the headwaters of the Koskokwim, thence down the entire length of that river to the coast. In the upper valley of the Koskokwim were found Dené tribes preserving the characteristics of the wide-spread Dené stock. About seven hundred miles from the mouth of the river, Eskimo influence began to be felt; two or three hundred miles farther down Eskimo customs had entirely replaced the native customs even in those communities where there was little or no mixture of Eskimo blood. The tendency of the Dené in this region to adopt Eskimo culture which has intruded from the Behring Sea coast is strongly marked and shows that the Eskimo culture is the more aggressive and the more advanced. At the mouth of the Koskokwim, the Eskimo communities have retained in full vigor their peculiar customs and mode of life, because that part of the Alaskan coast has not been visited by trading vessels or by whalers.

The general health and physical welfare of these communities as well as of those on the Koskokwin River were noticeably better than in those localities where the natives have been in continued contact with the white man's influence, as, for instance, on the Yukon and on Norton Sound. At the same time the mental and moral state of the former population is decidedly better than that of the latter. All observations tended to show that the inhabitants of Alaska, both Dené and Eskimo, undergo deterioration physical and moral under the influence of civilization.

Mr. Charles Hill-Tout gave an account of his researches into the "Ethnology of the Okanákēn," the easternmost division of the Salish of British Columbia. The subject was treated from the standpoint of habitat and old settlements, relation of the common language spoken by the whole division to contiguous linguistic divisions of the same stock, material and social culture, totemism, evidence from material culture and language bearing upon the origin of the stock before the division into its present grouping. The linguistic evidence points to a connection with Oceanic stocks. Specimens of Okanákēn myths were given, also an outline of the grammatical structure of the Okanákēn dialect.

Professor E. Guthrie Perry exhibited an interesting series of copper implements recently found together in the bed of the river at Fort Francis, Ontario. The fact that one of the pieces is tipped with silver leads Professor Perry to conclude that the material from which these implements were made came from the north shore of Lake Superior.

Another communication of special local interest was that by Professor Henry Montgomery on the "Archeology of Ontario and Manitoba."

Much of the seventeenth century's history of that portion of Canada now known as Ontario has been verified, and additional information obtained about the Iroquois, Hurons and Algonquins and also the earlier inhabitants by the archeologists Tache, Daniel Wilson, A. F. Hunter and David Boyle. Some of the collections are in the Toronto Provincial University, others in the Toronto Provincial Normal School, the Dominion Survey Mu-

seum in Ottawa and Laval University, Quebec. There have been several occupations of the province. The following are the principal kinds of remains found: marine and fresh-water shell objects, bone awls and knives, arrow points, stone knives and scrapers, stone wedges and chisels, stone gouges, stone pipes, gorgets or banner stones (generally made of Huronian slate), amulets (or perhaps ceremonial stones), pipes of pottery of many patterns, as well as vessels of pottery, the last being mostly broken. Mention was made of a large amulet or ceremonial stone nineteen inches in length, and made of limestone, which was recently found beneath the stump of a large oak tree the cross-section of which had two hundred and eighty rings of growth. The wedges, chisels and gouges are of good form and finish, and are plentiful. All these objects of manufacture have been found on or near the surface of the ground.

Ossuaries or circular bone-pits fifteen to twenty feet in diameter and six to eight feet in depth have been discovered near Georgian Bay and in a few counties bordering upon Lake Ontario. The writer of the paper referred to his work in these ossuaries in 1876 and 1878 in Durham and Simcoe counties. Articles of French manufacture occurred in some of them, and the crania in all of them are of the Huron form. Some ancient skulls found in other parts of Ontario were described as being of a very inferior type, the frontal portion being extremely low and narrow, and the supernumerary bones numerous.

Primitive paintings may be seen on the faces of rocks along the shores of a few of the northern lakes. It is not known by what people they were made.

There are aboriginal tumuli in southeastern Ontario and also in the vicinity of the Lake of the Woods and Rainy River. Already some interesting things have been obtained from them in the way of pottery vessels and of copper and stone implements and ornaments. Large oak trees grow upon some of these mounds. One long mound in eastern Ontario has been described as a "serpent" mound; but, the writer by a personal examination of this mound has not found satisfactory evidence that it was intended to represent a serpent. It bears very little resemblance to the famous serpent mound of Ohio. It is, however, undoubtedly artificial, and it shows a relationship with certain mounds of the province of Manitoba.

The archeological remains in Manitoba may be regarded as belonging to two classes, namely, those objects, such as grooved stone mauls and hammers, stone discs, arrow points and broken pottery, found upon or near the surface of the ground, and, secondly, tumuli, earthen ridges and house enclosures. The tumuli of earth are sometimes of considerable size, and often have human skeletons with vessels of earthenware and implements and ornaments of bone, shell, stone, antler and copper buried within them. The specimens obtained from these mounds are usually few in number. But they are very characteristic and instructive in Manitoba and vicinity. Long, wide ridges of earth occur in this province, the largest found being about 2,000 feet long, forty feet wide and three feet high. Of the many examined by the writer one such ridge in Dakota measured 2,688 feet in length. It is probable that these earth ridges were used for ceremonial purposes.

Two kinds of burial mounds occur, and also mounds which were used as house-sites, only objects which were of domestic use having been found in the latter. A burial mound, which the writer explored last year, has a definite structure of considerable interest. A burial pit, three feet and six inches in diameter and two feet deep, was found a little southeast of its center. The pit contained five human skeletons, one large earthen pipe decorated by a groove around its bowl and transverse grooves in the lower side of its horizontal stem. Its bowl was 2¼ inches across and 3¼ inches high. There were also with the pipe and skeletons a barbed flint arrow point, marine shell (two species) beads, one polished round stone the size of a very large marble, and a valve of the river shell Unio containing some red ochre. The burial pit extended through the soil and down into the subsoil. Around the pit and forming a circular area of about twelve feet in diameter the soil consisted of a purplish solidified mass. Upon this and extending over the pit was a calcareous layer from three to six inches in thickness and about twelve feet in diameter. There were two large stone boulders above the calcareous layer, and all were covered with the rich black prairie soil. Within this black soil, and about two feet above the calcareous layer, was a layer of yellow clay from four to six inches thick and about equal in extent to that of the calcareous layer covering the pit below. Usually in these mounds there is a variety of objects, shell pendants and necklaces, spoons, beads, bone armlets, stone pipes and pottery vessels. The two most characteristic objects buried with the human remains are small pottery urns of coiled ware decorated externally by a spiral furrow, and the straight, tubular, catlinite

stone pipes. The marine shell beads and the Michigan native copper objects are also somewhat characteristic. In addition to the three classes of tumuli and the ridges there are communal house-sites or large enclosures. The largest measured by the writer was eighty feet wide and two hundred and twenty-five feet long. The wall of this enclosure is now about ten feet thick and eighteen inches high. There are many cromlechs or stone-circles in Saskatchewan, and probably some occur in Manitoba. Possibly the extinct Arikaras of Dakota were related to the builders of the more ancient of the burial mounds in this region. A copper wedge, a sheet of native silver and copper, an amulet and other specimens from Ontario, as well as many photographs and drawings of Manitoba mound products, were exhibited to the members of the association.

In "The Blackfoot Medical Priesthood," Dr. John MacLean defined medicine men, or, to use a better term, the medical priesthood, as shamans, conjurers, doctors, prophets and priests, and gave the different grades in the priesthood. The subject of initiation was dealt with, and the course of instruction was outlined. Previous to this the would-be medicine man undergoes a period of voluntary seclusion, during which he fasts and sees visions. The dress and facial decoration of the fraternity was described, and the sacred numbers were explained. The subject of disease was next treated, the Blackfeet being particularly prone to small-pox and consumption. The causes of the diseases were discussed, especially the influence which the belief in evil spirits has upon the minds and bodies of the natives. The author then treated of the medicine man in connection with religion, such subjects as animism, sacred stones, sacrifice, spiritualism, hypnotism, prophecy and incantation being discussed, as well as medicine songs, charms and amulets. Lastly, the author considered native medicines and remedies, and discussed the value of the work of the medicine men among the natives, and the influence exercised by them on the native religion.

The western hemisphere did not by any means monopolize the attention of the section. In addition to the reports of standing committees already noted, a number of papers were presented and on a variety of subjects. Mr. D. G. Hogarth sent a paper giving the results of "Recent Hittite Research," which confirm the theory that the original home of the Hittites was Cappadocia. The city of Boghaz Kai was the center of the confederacy and contained the royal archives of the Hittite kings from the fifteenth to the twelfth centuries B.C.

Dr. T. Ashby presented a communication on "Prehistoric Antiquities in Malta." Excavations have been conducted by the government of Malta on the Corradino Hill, in which the cooperation of the British School at Rome has been cordially welcomed, and its investigations assisted in every way; the supervision has been entrusted to the director of the school and to Mr. T. E. Peet, student of the school, assisted by the constant cooperation of Dr. T. Zammit, curator of the museum. The great megalithic buildings of Gigantia, Mnaidra and Hağar-Kim, which Dr. Arthur Evans considers to have been buildings of a sepulchral character in which a cult of departed heroes gradually grew up, and other smaller prehistoric monuments of the islands, have been carefully described by Dr. Albert Mayr, though others have since become known, but excavation was needed in order that many essential facts might be ascertained. The investigation of the rock-cut hypogeum of Halsaflieni, the architectural features of which imitate in the most surprising way those of the sanctuaries above ground, has for the first time produced an adequate series, available for study, of the prehistoric pottery of Malta; for from the excavations of Hağar-Kim but little has been, unfortunately, preserved. Dr. Zammit and Professor Tagliaferro will shortly publish adequate descriptions of the hypogeum and its contents. Of the three groups of megalithic buildings on the Corradino Hill, two had been already in great part excavated in the nineties, and the complete clearing of the upper one, which apparently was of a domestic character, was the first work undertaken in May. Its plan is extremely irregular, and much of it can hardly have been roofed unless in thatch or woodwork. A considerable quantity of pottery was found, very similar in character to that of Halsaflieni, and belonging, like it, to the late neolithic period. It has some affinities with pottery recently found in Terranova, the ancient Gela, in Sicily, but in many respects is unique. Many flints were found, but no traces of metal. A stone pillar was found in one portion of the building, some two feet eight inches long and about ten inches in diameter, which may have been an object of worship. The excavation of a second and smaller group, nearer the harbor, had been already completed by Dr. Zammit and Professor Tagliaferro; but a third, further to the south, on the summit of the ridge, had never been examined, and it, too, was thoroughly investigated. An even larger quantity of

pottery of the same character was found, with flints and fragments of stone basins, etc. It approximates more in style to the larger megalithic buildings of the island, and has a facade with a more pronounced curve than at Hağar-Kim, constructed of very large blocks, but much ruined. The interior consists of several distinct groups of rooms (often apsidal) not intercommunicating. The construction is of rough masonry, with large slabs at the bottom, and smaller blocks higher up; the walls begin to converge, even at the height (5 to 6 feet) to which they are preserved, as though to form a roof. Into one of the rooms a very curious trough has at a later period been inserted; it is cut in a block of the local hard stone, eight feet nine inches long, three feet eight inches wide, and is divided by six transverse divisions into seven small compartments, which show much trace of wear. The object of it is not as yet apparent. Another more carefully constructed room, perhaps contemporary with the trough, has its walls partly of large slabs, partly of narrow pillar-like stones. The floors of these rooms are sometimes of cement, sometimes of slabs. Many bones of animals were found, but only one human skeleton, and that in disorder and at a comparatively high level. The use of standing slabs at the base of walls, with coursed masonry above, visible in these buildings, finds its parallel in the Giants' Tombs at Sardinia, the prehistoric huts of Lampedusa, and in many other places.

Dr. F. C. Shrubsall spoke on "The Influence of Geographical Factors on the Distribution of Racial Types in Africa." The movement seems to have been from north to south, following the course of the mountain ranges and across the continent eastward and westward following the great river systems. The influence of the nature and configuration of the land and of climatic conditions upon the natives was explained. The presence in certain regions of the tsetse fly and other parasitic pests led to modified conditions in the animal life and thus directly or indirectly influenced the occupation of these sections by the native races.

"A Study of Malaria in Ancient Italy," by Mr. W. H. S. Jones, was read by Dr. Shrubsall in the absence of the author. Malaria has exerted a powerful but unmeasured influence on the history of Rome. It is caused by a mosquito. The patient becomes immune only after many years. In order to escape from the mosquito, which can not fly far, towns were built on the hills. At a very early period Rome was marshy. Whether it was malarious before 500 B.C. is an open question, although the disease is thought to have been introduced by merchants from Africa as early as 600 or 700 B.C. Continuous wars brought about conditions that tended to increase the breeding of mosquitoes and thereby the prevalence of malaria. The periodicity of the fever gave rise to the belief that it was a divine visitation. There was thus a goddess of fever. The author cited early writers who mention fever.

A communication describing "A Cult of Executed Criminals in Sicily" was presented by Mr. E. Sidney Hartland. Certain of the Sicilian peasantry believe in the intercessory powers of beheaded malefactors, or "Decollati," to whom petitions are addressed. Instances ranging from the prayers of the love-lorn maiden to appeals for protection in times of attack by robbers were cited by the author. Dr. D. Randall-MacIver's paper on "A Nubian Cemetery at Anibeh" was read by Professor Gordon, and that of Mr. F. M. Dawkins on "The Excavations at Sparta of the British School at Athens," by Professor Myres.

Many social functions were held in connection with the week's program at Winnipeg, among them being receptions by Lord and Lady Strathcona, the Lieutenant-Governor and Lady McMillan, Mr. C. C. Chipman, commissioner of the Hudson's Bay Company for North America, and Mrs. Chipman, Chief Justice and Mrs. Howell, Principal and Mrs. W. J. Black, and the local executive committee. Excursions were also made to many points of interest in and about Winnipeg.

At the close of the meeting about 180 members, including the officers and guests of the association, were invited to take part in an excursion from Winnipeg to the Pacific coast and back. This was made possible through the generosity of the western provinces. The schedule was planned so as to include visits to the capitals and largest cities of the provinces as well as mountain resorts like Banff, Lake Louise and Glacier. The stop at Gleichen afforded an opportunity to see a group of Blackfeet Indians. The scientists highly appreciate and will long remember the courtesies extended by the reception committees at Regina, Moose Jaw, Calgary, Vancouver, Victoria and Edmonton. They were also much impressed by the rapid material development of the country and its splendid endowment of as yet unmeasured resources.

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